

Summary of  
Northern Contaminants Program  
Projects for 2002-2003



Indian and Northern  
Affairs Canada    Affaires indiennes  
et du Nord Canada

Canada

4



106-00527/

Summary of

# Northern Contaminants Program

Projects for 2002-2003





## Foreword

The Northern Contaminants Program (NCP) was established in 1991 in response to studies which showed the presence of contaminants in the Arctic ecosystem. Many of these contaminants had no Arctic sources. The three main contaminant groups of concern are persistent organic pollutants, heavy metals, and radionuclides. Some of these contaminants are found at unexpectedly high levels in animals at the top of the food chain and in humans. The NCP is led by Indian and Northern Affairs Canada and brings together federal departments (Indian and Northern Affairs Canada, Health Canada, Environment Canada, and Fisheries and Oceans Canada), the three territorial government departments (Yukon, Northwest Territories, and Nunavut), northern Aboriginal peoples' organizations (Council of Yukon First Nations, Dene Nation, Inuit Tapiriit Kanatami, and Inuit Circumpolar Conference) and university researchers. Together they work towards reducing and, wherever possible, eliminating contaminants in traditionally harvested foods and to provide information that assists informed decision-making by individuals and communities in their food use.

The NCP - Phase II is a five year program (1998-2003) which funds research on northern contaminants issues at about \$5.4 million per year, in addition to supporting the Centre for Indigenous Peoples' Nutrition and Environment (CINE) and the participation of Aboriginal peoples' organizations. A portion of the funds is directed to communicating the research results to communities. The education and communications part of the program is led by the representatives of the northern Aboriginal peoples' organizations. Between 1991-1996, NCP research was focussed on assessing where contaminants were found in the Arctic and at what levels, and confirming the source region. Under Phase II, the NCP shifted towards a greater emphasis on human health research, developing effective community dialogue, increasing community participation, and working towards international agreements to

control the release of contaminants. This is the last year of NCP - Phase II, and as such, there is a focus on completing the numerous projects that have been ongoing throughout the last few years.

People and organizations seeking funding for projects related to northern contaminants issues submit proposals to the NCP each year. A management committee consisting of representatives from government and northern Aboriginal peoples' organizations meet to evaluate the proposals and approve funding for projects which meet the goals of the program.

Anyone conducting research in the North is required to consult with the communities that will be involved in the research and complete consent forms. Project leaders are required to present their results at an annual NCP workshop, and to submit a brief description of their research results at the end of the year.

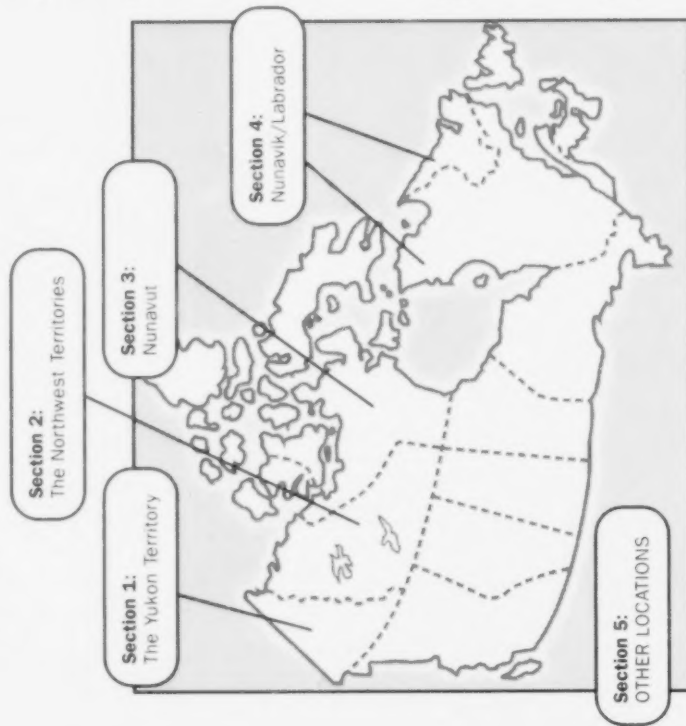
Every year since 1991 these results have been published as the "Synopsis of Research Conducted under the Northern Contaminants Program". These documents are available by contacting the NCP. More information about the program can be found on the NCP website: <http://www.aicnclnac.gc.ca/nctp/>

This booklet, the "Summary of Northern Contaminants Program Projects for 2002-2003" provides a quick, non-scientific reference guide for communities and other interested groups on current-year projects being conducted by the NCP.

# How to Use this Booklet

To help you find the information in this booklet that is of interest to you:

- The booklet is divided into five sections based on the geographical location of where projects are or will be mainly occurring (The Yukon Territory, The Northwest Territories, Nunavut, Nunavik/Labrador and Other Locations).



- Each project summary contains the question the project is answering, relevance (why the project is occurring), summary, and location.
- There are "icons" (please see following page) located throughout the pages of the booklet to help communicate what the project is about, how you can get more information about the project, and where and when the project is occurring.
- The **bold** words within the text of the booklet are defined in the Glossary of Terms in Appendix A at the end of the booklet.
- If you wish to search for a project by affiliation or project leader, or by key subject areas and contaminant please refer to Appendix B (Affiliations and Project Leaders) and Appendix C (Key Subject Areas and Contaminants) at the end of the booklet.
- If you have more questions about any of these projects, contaminants in the North or contaminants in general, there is a list of people whom you can contact for this information in Appendix D (For More Information) at the end of the booklet.

## EXPLANATION OF ICONS USED IN THIS BOOKLET PROJECT CATEGORY



Human Health  
project



Monitoring project

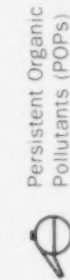


Communications  
project



International Policy  
project

# WHAT THE PROJECT IS STUDYING:



Persistent Organic  
Pollutants (POPs)



Seabirds



Heavy Metal  
Contaminants



Arctic fox



Radionuclide  
Contaminants



Polar bear



Caribou

Mercury



Dall's sheep



Traditional  
Knowledge



Marine  
Mammals



Traditional Food



Moose



Education

Mink



Administration



Wolverine

QA/QC  
Quality Assurance/  
Quality Control



Seals



People



Walrus



Whales



Fish



Snow



Seaducks

Rain



Water



Ocean



Air



Sediment

## OTHER DETAILS:



The project involves  
fieldwork



The project involves  
work taking place in  
a laboratory



The project involves  
computer models and  
database work



The project involves  
a workshop and/or  
a meeting



Contact information



The time frame of  
the project



The schedule of the  
project



The location  
of the project

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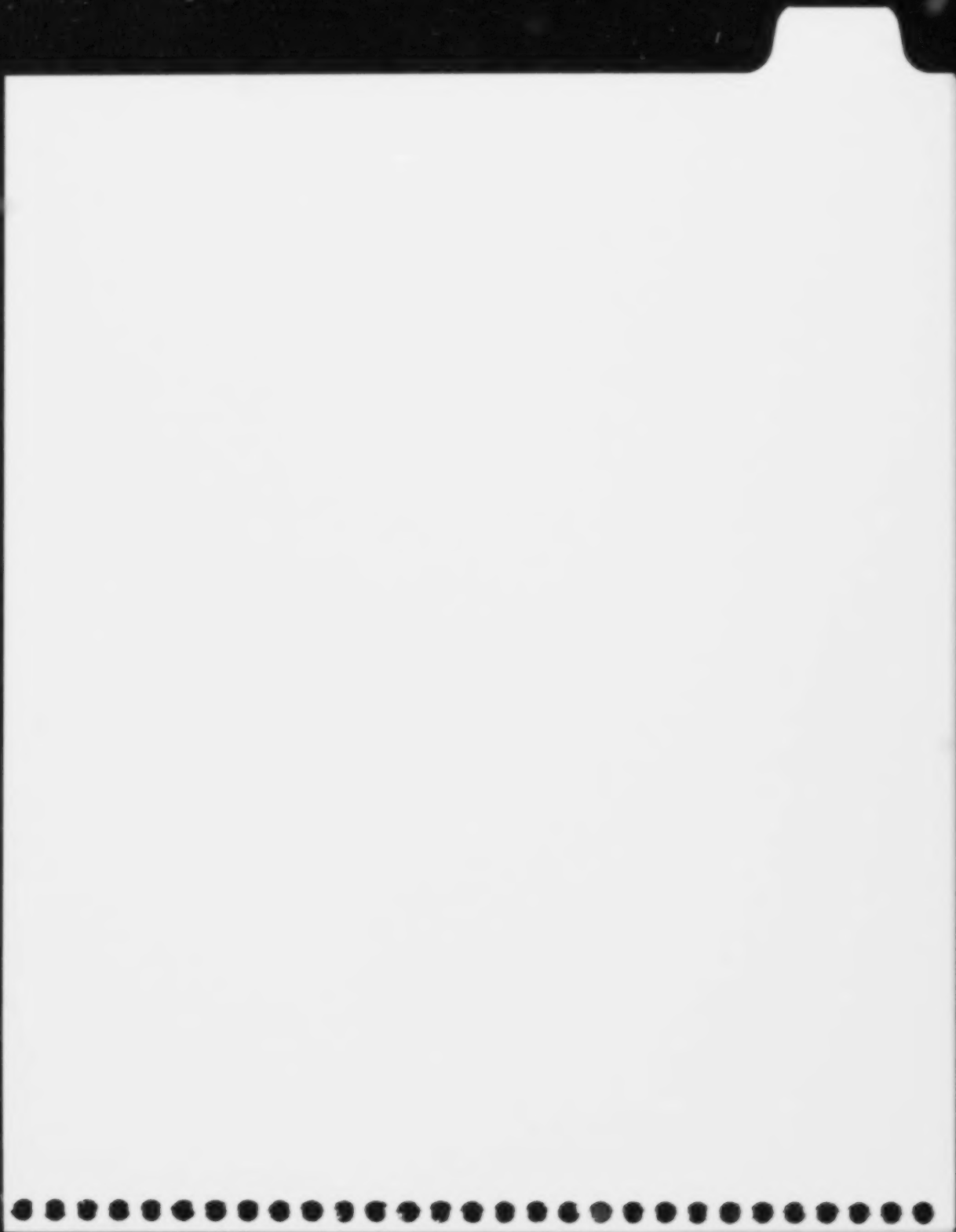
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# The Yukon Territory





# The Yukon Territory

## Revision and Expansion of Yukon Contaminant Fact Sheets

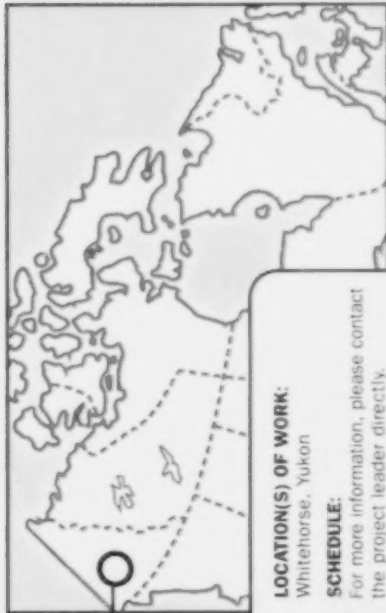
**Q** What contaminants are found in the Yukon, how do they get there, and are they dangerous?

### RELEVANCE:

A number of Yukon Contaminants Fact Sheets were produced in 1992 to provide information in plain language about contaminants found in the territory. These fact sheets cover **persistent organic pollutants (POPs)** such as **PCBs**, **DDT**, **toxaphene** and a number of **heavy metals** including **arsenic**, **mercury**, **cadmium** and **lead**. In recent years several new contaminants have been discovered in the Arctic including **polybrominated diphenyl ethers (PBDEs)** and **perfluorooctane sulfonate (PFOS)**, a type of **perfluorinated acid (PFA)**. PBDEs are used as additives in other materials such as plastics to reduce their flammability, while PFOS are used in products such as Scotch Guard®. It is important that information about these new contaminants also be made available to the Yukon people in an easy to read format. The current series of fact sheets also need to be updated since a great deal has been learned about these contaminants since 1992.

### PROJECT SUMMARY:

This project will be directed by the Yukon Contaminants Committee (YCC). A local consultant will be hired to conduct a literature search for new POPs, and to summarize new information about the POPs and heavy metals in the 1992 fact sheet series. The new fact sheets will be grouped to cover: DDTs, PCBs, toxaphene, PBDEs, PFOS, and metals. The metals category will cover mercury, **selenium**, lead, cadmium and arsenic. Each fact sheet will provide an overview of the nature of the contaminant and where it is found, how it enters the environment, and how it is toxic.

**LOCATION(S) OF WORK:**

Whitehorse, Yukon

**SCHEDULE:**

For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Pat Roach  
 Yukon Contaminants Committee  
 Indian and Northern Affairs Canada (INAC)  
 Yukon Region  
 345-300 Main Street  
 Whitehorse, Yukon  
 Y1A 2B5

Phone: (867) 667-3139

Fax: (867) 667-3271

E-mail: roachp@inac.gc.ca

**TIME FRAME:**

April 2002 - March 2003. Once the new fact sheets have been approved by the YCC, they will be produced and distributed throughout the Yukon. Copies will be made available to the **Northern Contaminants Program (NCP)** Secretariat and other Territorial Contaminants Committees.

**RELATED PROJECTS:**

"Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)" page 128.

## Yukon Contaminants Studies 1991-2001: A Decade in Review

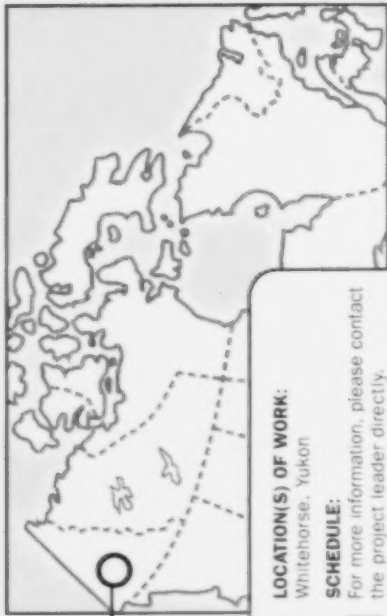
**Q** What research has been carried out under the Northern Contaminants Program (NCP) in the Yukon during the last ten years, and what have been the major achievements?

### RELEVANCE:

The Yukon Contaminants Committee (YCC) has been active since 1991 and some of the original members are still donating their time to the Committee. Over time, these members have developed a wealth of knowledge and perspectives about the **Northern Contaminants Program (NCP)**. The NCP has produced a significant body of research on contaminants in the Yukon. A summary of this research and its findings, the people who have been involved, and the major achievements of the NCP in the Yukon would provide a valuable reference source for government agencies, self-governments, First Nations, research scientists and the general public.

### PROJECT SUMMARY:

This project will document the work and knowledge gained in the Yukon during ten years and two phases of NCP research. A small booklet will be produced that covers: a brief history of the NCP in the Yukon; the principal contaminants and wildlife species studied during the research projects; the major local and international achievements; what current contaminants of concern are; why Yukon traditional/country foods are safe and healthy to eat; and the potential future focus of the NCP in the Yukon. The introduction would include a letter from the current Grand Chief of the Yukon First Nations providing an Aboriginal perspective on what the past ten years of the NCP has meant to the First Nations of the Yukon. The rest of the document will contain a reference list of all the projects funded over the two phases of the NCP; publications and databases that have resulted from these projects and where they can be found; contact addresses for the NCP including the Aboriginal partners; and websites that link to NCP resources. The booklet will be produced in a brochure format, and once approved will be distributed throughout the Yukon, to the NCP Secretariat and to other Territorial Contaminants Committees.

**LOCATION(S) OF WORK:**

Whitehorse, Yukon

**SCHEDULE:**

For more information, please contact the project leader directly.



**CONTACT INFORMATION:**  
**Project Leader:** Pat Roach  
 Yukon Contaminants Committee  
 Indian and Northern Affairs Canada (INAC)  
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 Whitehorse, Yukon  
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 Fax: (867) 667-3271  
 E-mail: roachp@inac.gc.ca



**TIME FRAME:**  
 April 2002 - March 2003.

## Yukon Contaminants Committee Communications Program

**Q** How can communities in the Yukon find out more about contaminants research and have opportunities to get involved in the Northern Contaminants Program?

**RELEVANCE:**

The Yukon Contaminants Committee (YCC) co-ordinates the communication of **contaminants** information and research initiatives in the Territory. The committee membership is diverse and consists of representatives from several federal and territorial departments, the Council of Yukon First Nations (CYFN), the Yukon Conservation Society and Yukon College. Several individual First Nations also play a key role on the Committee. Since its establishment, the YCC has acted as a link between the scientific community and Northerners on local, national and international contaminants issues and has tried to answer the questions Yukoners have regarding contaminants in the North:

"Can we eat our **traditional/country foods** and drink our water?"

"Where are the contaminants coming from?"

"Can we stop the contaminants from getting in the environment?"

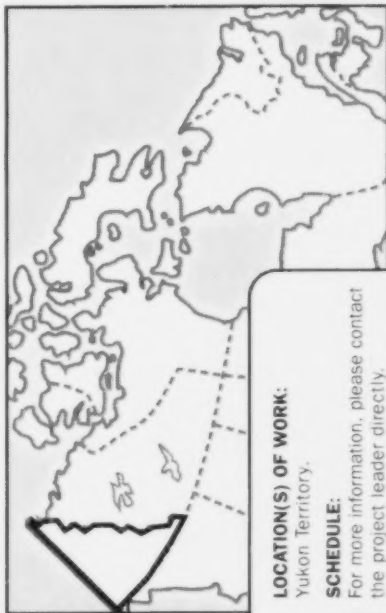
"Are there health effects?"

The Indian and Northern Affairs Canada (INAC) Whitehorse office provides secretariat support and the chair to the YCC.

**PROJECT SUMMARY:**

The YCC will continue to co-ordinate contaminants studies in the Yukon and communicate the results from all research projects as well as from other national and international initiatives. The YCC will continue to review all NCP project proposals involving communication initiatives in the Yukon as well as all Yukon project proposals for socio-cultural content. Committee members will continue to make themselves available to communities to discuss contaminant issues and will attend community meetings and workshops as required.




**LOCATION(S) OF WORK:**  
 Yukon Territory.

**SCHEDULE:**

For more information, please contact the project leader directly.


**CONTACT INFORMATION:**

**Project Leader:** Pat Roach  
 Yukon Contaminants Committee  
 Indian and Northern Affairs Canada (INAC)  
 Yukon Region  
 345-300 Main Street  
 Whitehorse, Yukon  
 Y1A 2B5

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 Fax: (867) 667-3271  
 E-mail: roachp@inac.gc.ca

**TIME FRAME:**

April 2002 - March 2003.





HG



## Retrospective Analysis of Contaminants in Yukon Moose

**Q** What are the heavy metal levels in Yukon moose? Is there a relationship between levels of heavy metals found in moose and the natural geologic character and ecoregions of the Yukon?

### RELEVANCE:

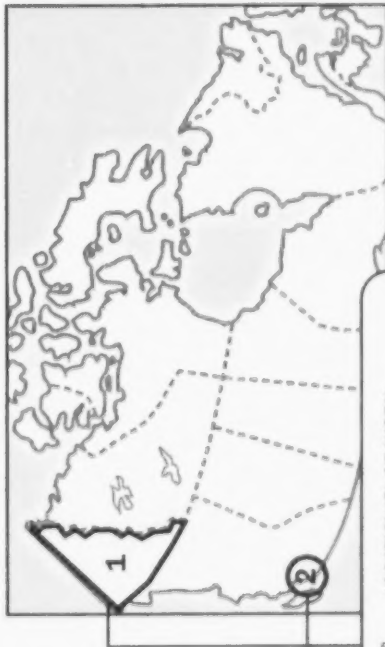
Moose represent a significant portion of the terrestrial country food consumed in the Yukon and there are ongoing concerns among residents who use these and other country food resources. Studies have shown that contaminant levels in the Yukon are comparable (with the exception of local hot spots) to other areas of the North, and that almost all traditional/country food is safe to eat. For the last 10 years, the Yukon Contaminants Committee (YCC), as part of the **Northern Contaminants Program (NCP)**, has been trying to answer questions from Northerners on **contaminants in traditional/country foods**. The Committee has collected moose tissues for **contaminant** analysis since 1993. Most of these samples have been analysed and integrated into the Yukon Contaminants Database, which now contains data on metals contamination from 400 moose samples covering most of the Yukon.

### PROJECT SUMMARY:

A considerable number of moose samples have been collected and analysed for contaminants since 1993. About 100 kidney samples from 2000 and 2001 still remain to be analysed for 26 different metals and this project will complete this work. The entire set of moose contaminants data from 1993 will then be analysed with respect to a recent digital geological map of the Yukon, and also with respect to ecoregions in the Yukon. Maps will be produced showing the levels of contaminants in each ecoregion. It is hoped that through this comparison the dynamics of contaminants in moose as they relate to the underlying geology and different ecoregions can be better understood. Such a comparison may also bring to light any geographical (on an ecoregion basis) "hot spots" for specific contaminants such as cadmium, which is an ongoing concern in moose in the Yukon. This comparison will also assist the Yukon Contaminants Committee and Yukon wildlife managers in defining future moose research from an ecoregion perspective.



HG

**LOCATION(S) OF WORK:**

1. Yukon
2. Vancouver, British Columbia

**SCHEDULE:**

The project will be continuing throughout the year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Pat Roach  
Yukon Contaminants Committee  
Indian and Northern Affairs Canada (INAC)  
345-300 Main Street  
Whitehorse, Yukon Territory  
Y1A 2B5

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Fax: (867) 667-3271  
E-mail: roachp@inac.gc.ca

**TIME FRAME:**

April 2002 - March 2003. Maps will be produced showing the levels of each of the 26 metals found in moose in each ecoregion. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report, as well as in a report suitable for publication. All data will be added to the Yukon Contaminants Database.

**RELATED PROJECTS:**

"Survey of Contaminants in Country Foods in the Selkirk First Nation Traditional Territory" page 18.



## Changes Over Time of Contaminants Found in Lake Laberge Food Web

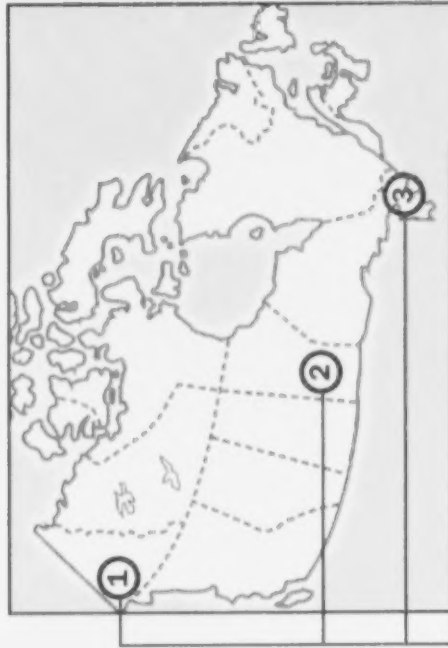
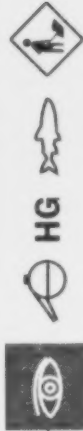
**Q** What factors are causing changes over time in the levels of contaminants in food fish in Lake Laberge?

### RELEVANCE:

Fish are monitored to provide guidance to communities on fish consumption and to indicate trends in the deposition of **contaminants**. However, there is considerable uncertainty about the factors responsible for the differences in contaminant concentrations in fish. These differences may be the result of changes in fish populations and in the **food-web** structure in the lake. Monitoring activities in 1991 showed that **persistent organic pollutants (POPs)** (e.g. **toxaphene**) levels in lake trout (muscle) and burbot (liver) from Lake Laberge were elevated. A public health advisory from Health Canada was issued that resulted in the closure of the commercial, sport and subsistence fisheries on the lake. It is important that the Ta'an Kwach'an, a First Nations band from Lake Laberge, know whether the fish in the lake are safe to eat. Since then, contaminant levels have dropped 2-5 times, possibly because the trout population has increased. It is thus necessary to determine the status of the lake's health in regards to contaminants.

### PROJECT SUMMARY:

This project will document changes over time in contaminant levels in Lake Laberge fish and investigate the processes responsible for the decline in POPs and **mercury** concentrations in fish from Lake Laberge from 1991 to 1999. The input of POPs to the lake has decreased while mercury inputs have increased. It is thought that heavy fishing pressure in the past altered the food web structure in Lake Laberge. As a consequence, the abundance of lake trout in Lake Laberge declined while species such as burbot and sucker increased. Recent data indicate that in 1999 lake trout were twice as abundant as in 1991, presumably because population levels have rebounded as a result of the closure of the fishery. This project will aim to better understand the processes controlling the levels of contaminants in northern fish populations by documenting concentrations of POPs such as "current use" **PCBs**, and selected metals (including mercury and **selenium**) at all levels in the food chain of Lake Laberge. No new samples will be obtained this year. Sample and data analysis will be completed for samples obtained in previous years. The data will be integrated into an already existing model of the fate of contaminants in northern lakes, and a food web model will be developed to explain contaminant **bioaccumulation** and **biomagnification**. This project may assist with interpreting changes in fish contaminant concentrations in the lake throughout the year as well as between lakes.

**LOCATION(S) OF WORK:**

1. Lake Laberge, Yukon
2. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba
3. University of Waterloo, Waterloo, Ontario

**SCHEDULE:**

The project will be continuing throughout the year. For more information, please contact the project leaders directly.

**CONTACT INFORMATION:**

**Project Leaders:** Pat Roach  
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**TIME FRAME:**

March 2000 - March 2003. The results of this project will be presented to the Ta'an Kwach'an as well as at the **Northern Contaminants Program (NCP)** Symposium and in scientific journals. A plain language report will be sent to the Yukon Contaminants Committee upon completion of the project.

**RELATED PROJECTS:**

"Contaminants in Burbot from Fort Good Hope, Northwest Territories" page 38; "Mercury in predatory fish in the Mackenzie River Basin" page 42; "Contaminants and Heavy Metals in Fish from Great Slave Lake and Slave River" page 44; "Methylmercury Risk Assessment for Arctic Populations" page 122.



HG



## Yukon Traditional/Country Foods Monitoring Program

**Q** Are the levels of contaminants in Yukon wildlife changing over time?

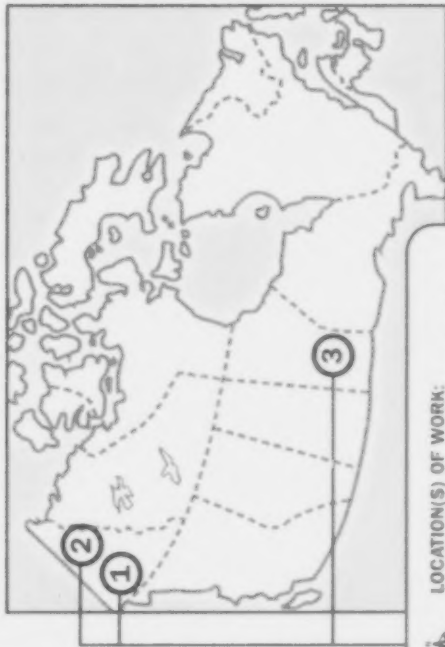
### RELEVANCE:

Elevated levels of **persistent organic pollutants (POPs)** have been found in burbot liver and lake trout tissue samples from the Yukon River System. In the past, the Yukon Territorial Government – Health and Social Services Department, in consultation with Health Canada, has issued public health advisories in response to elevated **toxaphene** levels in fish from Laberge and Atlin Lakes. These findings have raised concerns among residents who use these food resources. For the last 10 years, the Yukon Contaminants Committee (YCC), as part of the **Northern Contaminants Program (NCP)**, has been trying to answer questions from Northerners on **contaminants in traditional/country foods**. A database of trend information and a tissues archive have been produced by INAC/Whitehorse. Studies have shown that contaminant levels in the Yukon are comparable (with the exception of local hot spots) to other areas of the North, and that almost all traditional/country food is safe to eat. The Yukon Traditional/Country Foods Monitoring Program has been established to determine if contaminant levels are rising or falling, and to ensure that if any new contaminants are detected, that appropriate action is taken.

### PROJECT SUMMARY:

This study is part of a continuing program to monitor the levels and trends of contaminants in Yukon traditional/country foods and to address concerns raised by people in the Yukon regarding the safety of their foods. Burbot liver and muscle, and lake trout muscle samples will continue to be collected from Kusawa Lake, and lake trout from Quiet Lake in support of temporal trend monitoring. The Department of Fisheries and Oceans will provide a supply of salmon tissue samples for analyses from the following rivers: Klukshu (Chinook and Sockeye), Yukon River at Whitehorse (Chinook), and Fishing Branch River near Old Crow (Chum). These fish samples will be analysed for metals including **mercury, selenium**, and **arsenic** and a series of POPs such as toxaphene and **PCBs**. This year the trout tissue will also be analysed for polychlorinated biphenyl ethers (**PCBDEs**). All of these locations support subsistence fisheries.

Caribou tissues from the Finlayson herd in particular will be obtained through a hunter collection program, and analysed for **heavy metals** including **cadmium**. Every five years a comprehensive sampling of one woodland and one barren-ground caribou herd will be conducted, and this started in 2001/2002. An **archive** of samples is maintained in freezers at the Department of Indian and Northern Affairs, Whitehorse, Yukon.



#### LOCATION(S) OF WORK:

1. Quiet Lake, Kusawa Lake, Klukshu River, Yukon River (at Whitehorse), Yukon
2. Fishing Branch River (near Old Crow), Yukon
3. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba

#### SCHEDULE:

Burbot samples will be collected in the spring (March/April), and trout will be collected in the fall (September/October). Terrestrial mammal samples are collected annually. For more information, please contact the project leader directly.



#### CONTACT INFORMATION:

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#### TIME FRAME:

April 1997 - March 2003. The project results will be provided to the public through the Yukon Contaminants Committee. Results will also be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report. This report will also be provided to the Yukon Territorial Government's Department of Renewable Resources. Results will be compiled for publication and all data will be added to the Yukon Contaminants Database and made available for the use of the Northern Contaminants Program.

#### RELATED PROJECTS:

"Contaminants in Burbot from Fort Good Hope, Northwest Territories" page 38; "Mercury in predatory fish in the Mackenzie River Basin" page 42; "Contaminants and Heavy Metals in Fish from Great Slave Lake and Slave River" page 44; "Changes over time of contaminants found in a Lake Laberge food web" page 12; "Survey of Contaminants in Country Foods in the Selkirk First Nation Traditional Territory" page 18.



HG



## Concentrations of Selenium and Cadmium in Wild Yukon Mink

**Q** Are mink becoming contaminated with heavy metals as a result of eating contaminated fish?

### RELEVANCE:

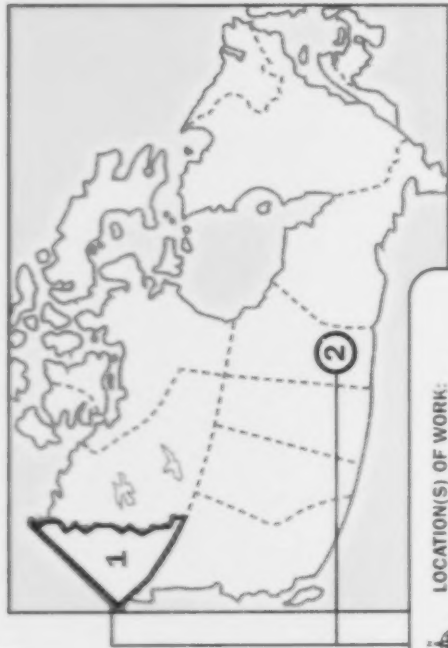
First Nations in the Yukon are interested in knowing whether wild Yukon mink, an important species for trapping, are becoming contaminated with **heavy metals** due to their diet of fish. This study fits within the **Northern Contaminants Program (NCP)** Blueprint for Phase II by investigating a species (in this case mink) exposed to levels of **contaminants** which may be **toxic**.

### PROJECT SUMMARY:

Another project is obtaining kidney and liver samples from mink collected by Yukon trappers as part of their normal trapping activities. These samples will be analysed for total methyl mercury to assess the levels of mercury in mink which consume fish known to contain high levels of mercury.

This project builds on the above work by analysing the same mink kidney samples for selenium and cadmium, and will also assess the levels of selenium and mercury in 10 mink brain samples. High levels of cadmium have been found in moose, caribou and grouse from certain areas in the Yukon. Measuring cadmium in the kidneys of mink from these same areas will provide an indication of whether high levels of cadmium are also found in mink, and by extension in the aquatic ecosystem. The analysis of mink kidneys for selenium can be compared with existing mink and fish data obtained during previous studies. These data will also be compared with the mercury data to understand better if selenium is affecting mercury as it moves through the various organs in mink.





#### LOCATION(S) OF WORK:

1. Various locations in Yukon
2. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba

#### SCHEDULE:

The project will be taking place throughout the year. For more information, please contact the project manager directly.



#### CONTACT INFORMATION:

**Project Leader:** Pat Roach  
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#### TIME FRAME:

April 2002 - March 2003. The samples are being collected from Yukon trappers through another related project. Project results will be communicated to the public through the Yukon Contaminants Committee, the Trappers Association magazine and public meetings, with local First Nations, and in local newspapers and on radio as news items. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report. All data will be added to the Yukon Contaminants Database.

#### RELATED PROJECTS:

"A preliminary assessment of perfluorinated compounds in the Canadian Arctic" page 112.



HG TK



## Survey of Contaminants in Country Foods in the Selkirk First Nation Traditional Territory

**Q** Are moose and trout in the Selkirk First Nation Traditional Territory safe to eat?

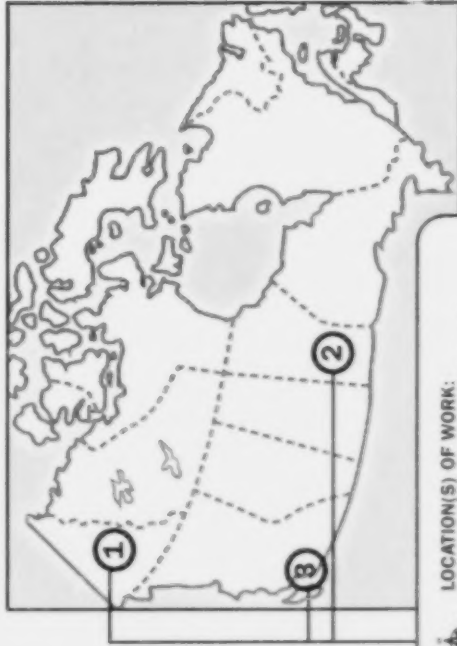
### RELEVANCE:

Members of the Selkirk First Nation, like many Aboriginal Yukoners, are attempting to maintain many aspects of their traditional lifestyle. One important aspect is hunting and gathering traditional foods from the land and such foods are still the mainstay of the everyday diet. Over the past decade, there has been much discussion and controversy about **contaminants** in the Canadian Arctic, and Selkirk First Nation members have become concerned about the safety of consuming country foods from their traditional territory. Previous work on seven moose from the territory indicates that the kidneys contain high levels of **cadmium**, such that the recommended annual intake of cadmium for humans could be exceeded after eating only 3 or 4 moose kidneys, not taking into account other potential sources of the metal.

### PROJECT SUMMARY:

The purpose of this project is to determine if moose and trout from the Selkirk First Nation Traditional Territory are safe to eat, and to help restore the confidence of the First Nation's people in their traditional lifestyle. The project will be carried out within the traditional territory, and for the most part by members of the First Nation. Samples of lake trout and moose that are traditionally taken from the land will be collected and analysed for a range of 26 contaminants, including heavy metals and **organochlorines**. Fish will also be analysed for **organochlorines**, **mercury**, **selenium** and **arsenic**, in order to be able to compare the results with data in the Yukon Contaminants Database. Sampling will depend heavily on **traditional knowledge** which will be used to identify traditional hunting and fishing sites for moose and trout. Elders will ensure that the collection and sampling takes place in a manner respectful of the land and animals, and in accordance with traditional laws. Any samples not used will be archived for future use. The results will be interpreted with respect to possible health concerns for First Nations, as well as in terms of general environmental concerns.

Selkirk First Nation participants who demonstrate an interest and aptitude for this work will be provided the opportunity for further education with financial support from the Selkirk First Nation Education Department.



#### LOCATION(S) OF WORK:

1. Selkirk First Nation Traditional Territory, Yukon
2. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba
3. Elemental Research Inc., Vancouver, British Columbia



#### SCHEDULE:

A public meeting with the Selkirk First Nation will be held at the beginning of the project to inform people about the study and to encourage participation. Moose and trout samples will be collected through the spring, summer and fall of 2002. Analysis of the samples and interpretation of the results will take place over the winter. For more information, please contact the project leader directly.



#### CONTACT INFORMATION:

**Project Leader:** Selkirk First Nation  
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E-mail: [trudeau@selkirkfn.com](mailto:trudeau@selkirkfn.com)

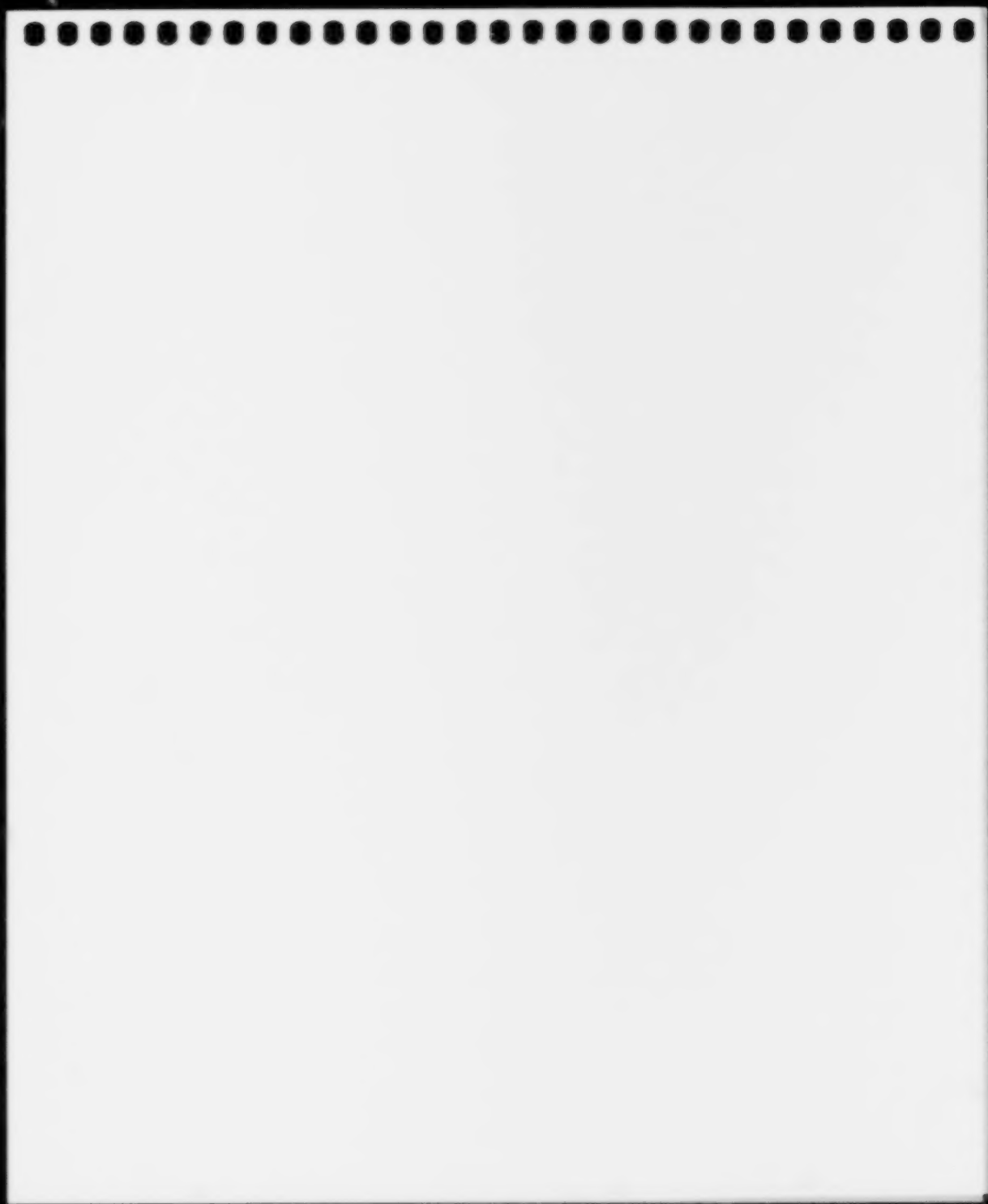


#### TIME FRAME:

April 2002 - March 2003. Results of the project will be communicated directly to the members of the Selkirk First Nation during their traditional spring gathering. A full technical report will be produced for a scientific audience, and a plain language report for a non-scientific audience. In addition, a brief brochure or flyer that summarizes the key results will be distributed within the First Nation. All data will be added to the Yukon Contaminants Database, as well as to the Selkirk First Nation Contaminants Database.

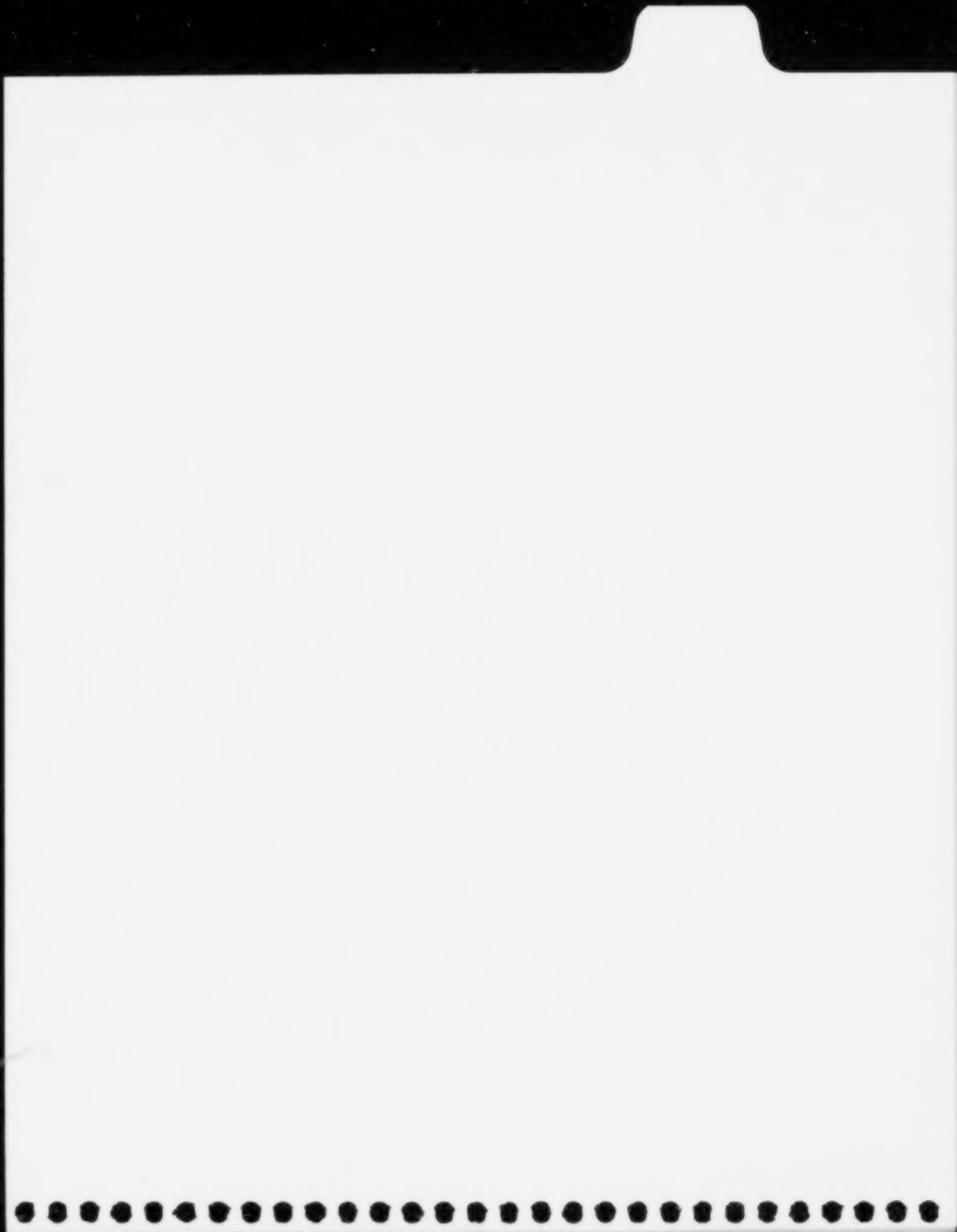
#### RELATED PROJECTS:

"Yukon Traditional/Country Foods Monitoring Program" page 14; "Retrospective Analysis of Contaminants in Yukon Moose" page 10.



# The Northwest Territories





# The Northwest Territories





## Regional Contaminants Co-ordinator: Sahtu Dene Council

**Q** How can we better communicate information on contaminants research with communities in the Sahtu region?

### RELEVANCE:

The Sahtu, who rely heavily on **traditional/country foods**, have many concerns regarding **contaminants** in these food sources. Also of concern is the impact contaminants may have on animals and the health of the people and the environment. Language barriers, remoteness, and the absence of regular community publications hinder the communication of timely information on contaminants to the Sahtu people. A Regional Contaminants Co-ordinator (RCC) will assist in providing residents of Sahtu communities with information in their own language about contaminants, ongoing research in the region and the benefits of a traditional diet. The RCC will increase opportunities for Sahtu communities to obtain knowledge concerning contaminants and assist them in making informed decisions about the food they eat.

### PROJECT SUMMARY:

The RCC will communicate information on contaminants to the community members in the Sahtu Settlement Area. This information will be delivered through individual discussions, plain language presentations and workshops, as well as via newsletters, Sahtu.net website postings and email. A workshop will be conducted in each of the five Sahtu communities to report contaminant research results, and to address community concerns about contaminants. The RCC will also assist communities in identifying and prioritizing contaminants issues, and help to communicate community concerns and priorities to the appropriate authorities. As well, the RCC will address local information requirements on contaminants related to traditional/country foods and to the health and safety of the environment. The RCC will also assist researchers with community consultations, with the negotiation of research agreements for funded projects, and with the reporting of project results to communities. Ongoing personal contact will be available for those wishing to express concerns regarding Sahtu contamination issues and residents will be continually consulted on all relevant contaminant issues. A major focus of communications activities this year will be the **Canadian Arctic Contaminants Assessment Report II**.



**LOCATION(S) OF WORK:**

Communities throughout the Sahtu Settlement Area.

**SCHEDULE:**

The RCC will be active throughout the year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leaders:** Larry Hutchison / Brian Davidson

Sahtu Dene Council

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Deline, Northwest Territories

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Fax: (867) 589-4908

E-mail: sahtu-info@sahtu.ca

**TIME FRAME:**

April 2002 - March 2003.

**RELATED PROJECTS:**

"Regional Contaminants Co-ordinator: Nunavik" page 102;  
 "Regional Contaminants Co-ordinator: Labrador Inuit Association" page 104;  
 "Regional Contaminants Co-ordinator: Dogrib Treaty 11 Council" page 26;  
 "Regional Contaminants Co-ordinator: Inuvialuit Settlement Region" page 28;  
 "Regional Contaminants Co-ordinator: Gwich'in Tribal Council" page 30;  
 "Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)" page 128.

## Regional Contaminants Co-ordinator: Dogrib Treaty 11 Council

**Q** How can we better communicate information on contaminants research with communities in the Dogrib region?

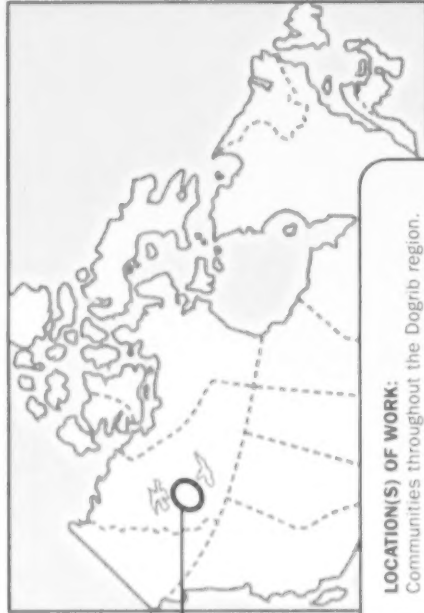
### RELEVANCE:

The Dogrib people are very active in their traditional pursuits and harvest animals, fish and plants which form an important part of their daily diet. Traditional/country foods benefit the health and economy of the Dogrib; therefore, changes resulting from **contaminants** can have a significant impact on the Dogrib Nation as a whole. Being on the land is implicit to the Dogrib identity and participating in traditional activities is known to improve the health, spiritual well-being, and overall positive state of the Dogrib people. Since Dogrib Treaty 11 has not previously had a Regional Contaminants Co-ordinator, the establishment of this position will be integral to addressing contaminants related concerns in the region.

### PROJECT SUMMARY:

The RCC will communicate information on contaminants to Dogrib community leaders and community members using individual discussions, workshops and plain language presentations based on regionally relevant resource materials. The RCC will identify community concerns and questions regarding contaminants, address local information requirements about contaminants related to **traditional/country foods** and to the health and safety of the environment, and will act as a liaison between the communities and Aboriginal and government agencies and industry, as needed. In particular, the RCC will assist Dogrib communities identify research projects based on priority contaminants issues, and will work to increase regional and local capacity to deal with environmental and environmental health issues. The RCC will also work with the **Northern**

**Contaminants Program (NCP)** administration and scientists to facilitate their relationships with Dogrib communities, and will also assist researchers with community consultations, in negotiating research agreements and with reporting project results to Dogrib communities. A major focus of communication activities this year will be the **Canadian Arctic Contaminants Assessment Report II**.



**LOCATION(S) OF WORK:**

Communities throughout the Dogrib region.

**SCHEDULE:**

The RCC will be active throughout the year. For more information, please contact the project leader directly.



**CONTACT INFORMATION:**

**Project Leader:** Ted Blondin  
Manager, Land Claims Negotiations  
Dogrib Treaty 11 Council  
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X0E 0Y0  
  
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E-mail: vblondin@tlcho.com



**TIME FRAME:**

April 2002 - March 2003.

**RELATED PROJECTS:**

"Regional Contaminants Co-ordinator: Nunavik" page 102;  
"Regional Contaminants Co-ordinator: Sahtu Dene Council" page 24;  
"Regional Contaminants Co-ordinator: Labrador Inuit Association" page 104;  
"Regional Contaminants Co-ordinator: Inuvialuit Settlement Region" page 28;  
"Regional Contaminants Co-ordinator: Gwich'in Tribal Council" page 30;  
"Communication Strategy for Canadian Arctic Contaminants Assessment 128.

## Regional Contaminants Co-ordinator: Inuvialuit Settlement Region

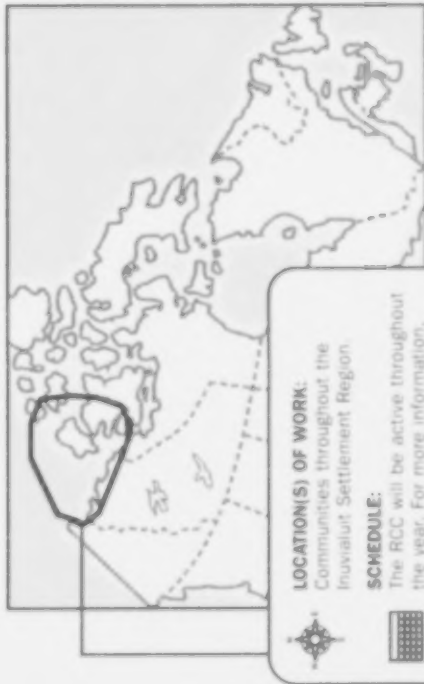
**Q** How can we better communicate information on contaminants research with communities in the Inuvialuit Settlement Region?

### RELEVANCE:

Inuvialuit have a broad range of concerns related to **contaminants** and their effects on wildlife and human health within the Inuvialuit Settlement Region (ISR). Therefore, it is important to have an ongoing, co-ordinated and culturally sensitive exchange of information and research results among researchers, project managers and community members at community and regional levels. Language and cultural differences have been major obstacles to effective communication in Inuvialuit communities. Promising communication strategies have now been developed at the community level and working relationships have now been established at the regional and inter-regional levels, and with research institutions and government departments and agencies. Discussions on contaminants were held with Hamlet Councils, Community Corporations, and with Hunters and Trappers Committees during a successful community tour in January 2001.

### PROJECT SUMMARY:

The Regional Contaminants Co-ordinator (RCC) in the ISR will help Inuvialuit to understand more about contaminants and how they enter the **food chain** and affect wildlife and people. Communication will take place through workshops, updates at conferences and meetings, and using regionally relevant resource materials developed with full consultation with partners and resource personnel. A previously developed poster on cigarettes and nutritional fact sheets will be more widely distributed. Presentation slides will be developed to illustrate the health effects of **mercury, cadmium, lead, organochlorines**, and **PCBs**. Presentation materials will also provide information on the benefits of a traditional diet and provide guidance on the consumption of **traditional/country foods**. Information will be provided specifically to schools and school children and more opportunities will be created for sharing ideas and providing feedback. As a result, the Inuvialuit will be able to ask questions and communicate concerns about contaminant issues as well as make informed decisions about the foods that they consume. The RCC will provide a point of contact for responding to questions and facilitating interactions within (and among) Inuvialuit communities, the **Northern Contaminants Program (NCP)**, and scientists. The RCC will also help to communicate community concerns and priorities, with regards to contaminants, to decision-making bodies at the regional, national and international levels. A major focus of communication activities this year will be the **Canadian Arctic Contaminants Assessment Report II**.

**LOCATION(S) OF WORK:**

Communities throughout the Inuvialuit Settlement Region.

**SCHEDULE:**

The RCC will be active throughout the year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Nellie J. Cournoyea,  
Chair and Chief Executive Officer  
Inuvialuit Regional Corporation  
P.O. Box 2120  
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X0E 0T0

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E-mail: rconnell@irc.inuvialuit.com

**TIME FRAME:**

April 1999 - March 2003.

**RELATED PROJECTS:**

"Regional Contaminants Co-ordinator: Nunavik" page 102;  
"Regional Contaminants Co-ordinator: Sahtu Dene Council" page 24;  
"Regional Contaminants Co-ordinator: Labrador Inuit Association" page 104;  
"Regional Contaminants Co-ordinator: Dogrib Treaty 11 Council" page 26;  
"Regional Contaminants Co-ordinator: Gwich'in Tribal Council" page 30;  
"Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)" page 128.

## Regional Contaminants Co-ordinator: Gwich'in Tribal Council

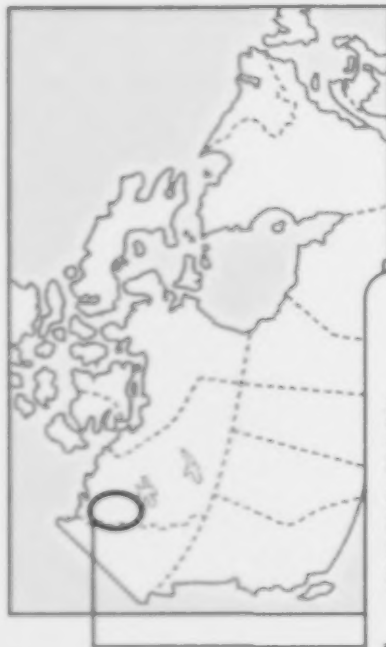
**Q** How can we better communicate information on contaminants with communities in the Gwich'in region?

### RELEVANCE:

The Gwich'in, who rely heavily on **traditional/country foods**, have many concerns regarding **contaminants** in these food sources, and the impact of these contaminants on the **food chain** and the health of the people and the environment. A Regional Contaminants Co-ordinator (RCC) will continue to assist in providing residents of Gwich'in communities with information about risks from these contaminants as well as the benefits of consuming traditional/country food. The RCC will also increase opportunities for the Gwich'in communities to become involved in contaminants issues and help them make informed decisions about the food they eat.

### PROJECT SUMMARY:

The RCC will communicate information on contaminants to community members in the Gwich'in Settlement Area. This information will be delivered through individual discussions and through presentations and workshops based on regionally relevant resource materials. The RCC will help communities to identify and prioritize contaminants issues, and will help communicate community concerns and priorities to the appropriate authorities. In addition, the RCC will address local information requirements on contaminants related to traditional/country foods and to the health and safety of the environment. The RCC will also assist researchers with community consultations, with the negotiation of research agreements for funded projects, and with the reporting of project results to communities. The RCC position is a capacity building position which provides the opportunity for an individual from the Gwich'in Settlement Area to learn about contaminants and subsequently act as the contact for two-way exchange of information between community members and the **Northern Contaminants Program (NCP)**. A major focus of communication activities this year will be the **Canadian Arctic Contaminants Assessment Report II**.

**LOCATION(S) OF WORK:**

Communities throughout the  
Gwich'in Settlement Area.

**SCHEDULE:**

The RCC will be active throughout  
the year. For further information,  
please contact the project leader  
directly.



**CONTACT INFORMATION:**  
Project Leader: Fred Carmichael  
President  
Gwich'in Tribal Council  
Box 1509  
Inuvik, Northwest Territories  
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Phone: (867) 777-4869  
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E-mail: gtcmail@inuvik.net



**TIME FRAME:**  
April 2000 - March 2003

**RELATED PROJECTS:**

"Regional Contaminants Co-ordinator: Nunavik" page 102;  
"Regional Contaminants Co-ordinator: Sahtu Dene Council"  
page 24; "Regional Contaminants Co-ordinator: Labrador Inuit  
Association" page 104; "Regional Contaminants Co-ordinator:  
Dogrib Treaty 11 Council" page 26; "Regional Contaminants  
Co-ordinator: Inuvialuit Settlement Region" page 28; "Communi-  
cation Strategy for Canadian Arctic Contaminants  
Assessment Report II (CACAR II)" page 128.

## Denendeh Tour – North Slave and South Slave Regions

**Q** What can be done to better communicate contaminant information to communities in the North and South Slave regions of the Northwest Territories?

### RELEVANCE:

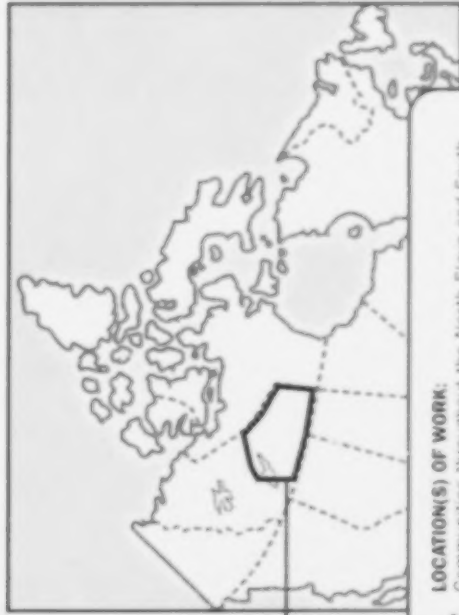
An effective way to communicate **contaminant** research results and information about the **Northern Contaminants Program (NCP)** is to have a small, knowledgeable team of experts spend a few days in a community discussing contaminants and related information with community members. This has been successfully done in recent years in other regions of the Northwest Territories. The advantages of hosting workshops in communities are that many community members can be reached and they will hear the message from knowledgeable resource people who can answer their questions immediately. Community members are as free as they would be with their families and neighbours to ask questions and raise concerns about contaminants. This approach also strengthens relationships between community members and NCP representatives, particularly scientists.

### PROJECT SUMMARY:

A contaminants communication tour will be held in the fall of 2002 in the South Slave and North Slave Regions of the Northwest Territories (Denendeh). Visits are proposed for Rae-Edzo, Gameti, Wekweti, Wha Ti, N'dilo/Dettah, Fort Resolution, Fort Smith, Hay River, Lutsel K'e, and Yellowknife. The tour will bring a team consisting of an NCP representative, a representative from the Dene Nation, a health specialist and a scientist to communities in this region. Prior to each visit, a community liaison person will be hired to help organize meetings and events, and to provide a point of contact for any further work. The purpose of these visits is to communicate the goals and priorities of the NCP, to discuss current contaminant projects in the area, to listen to the concerns of the communities about contaminants in the environment, and to help communities make informed decisions about the consumption of **traditional/country foods**. Tours will also focus on communicating the benefits of a traditional diet as well as the **Canadian Arctic**

**Contaminants Assessment Report II**. The team will take advantage of the time in the community to meet with resource harvester organizations, community representatives, schools and others. With this tour, all regions and most communities in the Northwest Territories will have been visited. A trip report will be prepared outlining the comments and concerns raised at each community, and a final report to summarize the successes and challenges for all the tours held over the past several years in the Northwest Territories.



**LOCATION(S) OF WORK:**

Communities throughout the North Slave and South Slave Regions of the Northwest Territories.

**SCHEDULE:**

The tour is scheduled to take place in fall 2002. Prior to the tour, a community liaison person will be hired in each community. For further information, please contact the project leaders directly.

**CONTACT INFORMATION:**

**Project Leaders:** Chris Paci  
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Phone: (867) 873-4081

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Carole Mills

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**TIME FRAME:**

April 2002 - March 2003.

**RELATED PROJECTS:**

“Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)” page 128.

## Communication of Northern Contaminants Program (NCP) Results in the Northwest Territories using Various Media

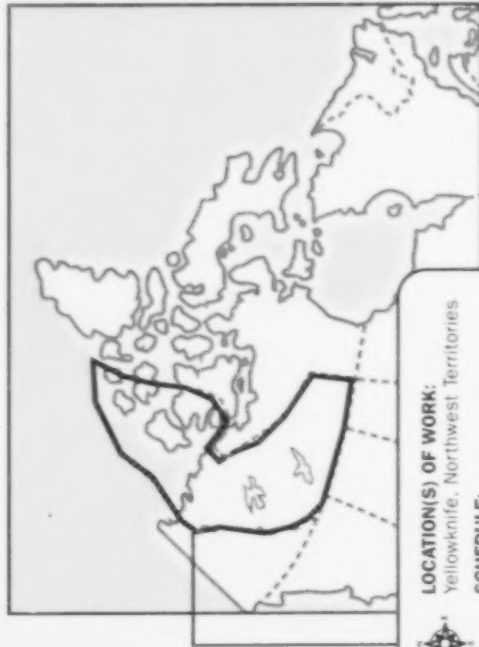
**Q** What can be done to better communicate contaminant information with communities in the Northwest Territories?

### RELEVANCE:

One of the main objectives of the **Northern Contaminants Program (NCP)** is effectively communicating results of NCP research to Northerners. A considerable amount of research has been carried out in the Northwest Territories under Phase II of the NCP and there is a need to provide this information to residents in an easily understood summary. Such information will help residents make informed decisions concerning the harvesting and consumption of **traditional/country foods**. Oral communication has always been a popular and effective means of communicating information in the Northwest Territories, particularly in the smaller communities. For residents whose first language is not English, radio programming in local languages is often the most effective way to provide news and information.

### PROJECT SUMMARY:

In this project, both audio and printed media will be used as a means to communicate important results recently generated through NCP research. An insert will be developed for distribution in the territorial newspaper. This insert will include short articles, photographs, messages, questions and answers, and a kids corner. A similar insert was produced at the end of Phase I (1997). To target a wider audience, audio recordings of the key research results will also be made by a local recording company in several languages including English, French, Dogrib, Chipewyan, North Slavey, South Slavey, Gwich'in and Inuvialuktun. These recordings of approximately 15-30 minutes in length will be made available on compact disk and/or cassette tape, and will be provided to all community radio stations for broadcast on local programs. Important questions raised during the community visits and meetings will also be answered on these recordings. Meaningful information on research related to contaminants in the Northwest Territories will be provided to residents thereby helping them make informed decisions about harvesting and the consumption of traditional/country foods.

**LOCATION(S) OF WORK:**

Yellowknife, Northwest Territories

**SCHEDULE:**

The project will be ongoing throughout the year. For more information, please contact the project leaders directly.

**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2002 - March 2003.

**RELATED PROJECTS:**

"Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)" page 128.

## Northwest Territories Environmental Contaminants Committee

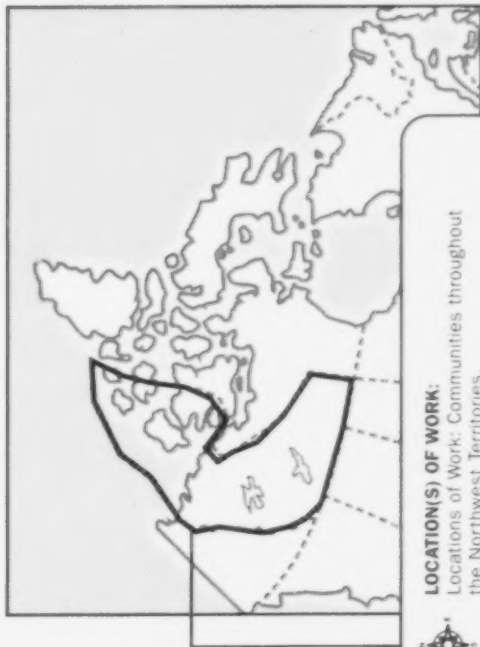
**Q** How can people in the Northwest Territories find out more about contaminants research and have opportunities to get involved in the Northern Contaminants Program?

### RELEVANCE:

The **Northern Contaminants Program (NCP)**, through the Northwest Territories Environmental Contaminants Committee (NWT ECC), includes communities and regions in the NWT in research and communication efforts. The committee oversees the co-ordination of **contaminants** information and research initiatives in the territory. The NWT ECC also provides the opportunity for researchers and communities to provide input into contaminants activities. The committee is composed of representatives from various departments in the federal and territorial governments, as well as national and regional Aboriginal partners. Each representative is actively involved in either environmental or human health activities, which allows the committee to make decisions on most contaminant-related issues. The Indian and Northern Affairs Canada (INAC) Yellowknife office provides secretariat support to the NWT-ECC.

### PROJECT SUMMARY:

The NWT ECC will facilitate the process of collaborative study, assessment and communication of information to residents of the NWT about the presence and possible effects of contaminants in the environment, including northerners. The NWT-ECC will provide a forum for the two-way transfer of contaminants information between NWT residents, researchers, the Northern Contaminants Program, and other contaminants-related programs; continue to develop a communications network in the territory; produce and distribute a newsletter on contaminants news for the NWT; continue building the resource library as a way to provide contaminants information to NWT residents; provide information and assistance to residents of the NWT in addressing their contaminant concerns; review NCP operational documents and participate on various NCP committees; and continue with regular conference call meetings, as well as hold one in-person meeting. Minutes of these meetings will be available on request from the Committee chairperson.


**LOCATION(S) OF WORK:**

Locations of Work: Communities throughout the Northwest Territories.

**SCHEDULE:**

For more information, please contact the project leader directly.


**CONTACT INFORMATION:**

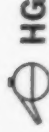
**Project Leader:** Carole Mills  
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**TIME FRAME:**

April 2002 - March 2003.





## Contaminants in Burbot from Fort Good Hope, Northwest Territories

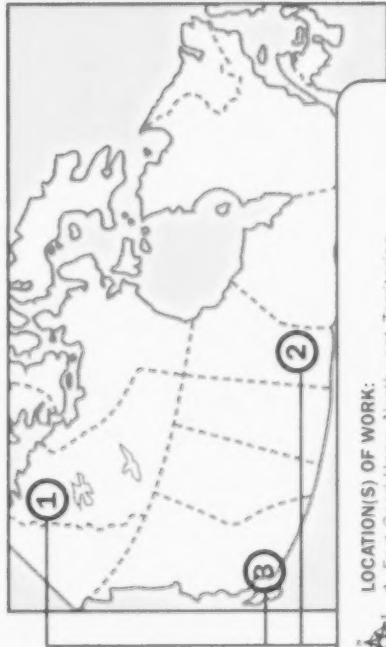
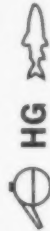
**Q** Are the levels of persistent organic pollutants (POPs) and heavy metals in burbot from Fort Good Hope changing over time?

### RELEVANCE:

More needs to be known about levels of **persistent organic pollutants (POPs)** and **heavy metals** in fish in Arctic marine and freshwater environments, and about the changes in these levels over time. Much of the information that is available has limited scientific value because it is based on too few samples. Therefore, there is a need for a well-designed study on changes in **contaminant** levels over time at one location where information already exists on contaminants, fish and the environment. Burbot, a predatory bottom-feeding fish species, is suitable for monitoring contaminants because it does not change its location in a lake or river and has a high fat content in the liver (contaminants tend to accumulate in fat – **lipophilic**). As well, data exist from previous studies for POPs in burbot livers, as well as for **mercury**, **selenium** and **arsenic** in muscle and liver of burbot from the Fort Good Hope area. This information also allows for an evaluation of the effectiveness of international contaminant control programs.

### PROJECT SUMMARY:

This ongoing project will study changes over time in levels of POPs, such as **organochlorines** and **organobromines**, and **heavy metals** (mercury, selenium, arsenic) that **bioaccumulate** in livers of burbot from the Fort Good Hope area. Approximately 40 burbot from the Mackenzie River at Fort Good Hope (Rampart Rapids) will be collected in December 2002, and the livers from 20 of these fish will be analysed for POPs. The livers and muscle of all 40 fish will be analysed for the three heavy metals listed above. In addition, contaminant levels in liver samples collected and analysed since 1988 will be compared to determine trends in these levels during this eleven-year period of time. This information will be used to determine whether contaminant levels in the fish, and people living in Arctic communities who consume them as part of their traditional diet, are increasing or decreasing with time. The results will assist Canada's efforts for better international controls of these substances.



#### LOCATION(S) OF WORK:

1. Fort Good Hope, Northwest Territories
2. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba
3. Institute of Ocean Sciences, Department of Fisheries and Oceans, Sidney, British Columbia

#### SCHEDULE:

Samples will be collected in December 2002. Please contact the project leaders directly for more information.



#### CONTACT INFORMATION:

**Project Leaders:** Gary Stern  
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#### TIME FRAME:

April 1999 - March 2003. Results have been and will continue to be communicated to the residents of Fort Good Hope. Results will also be presented at the Annual **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report, as well as in scientific journals. A plain language report will be provided to the NWT Environmental Contaminants Committee once the project has been completed. The results will also be communicated to the Department of Indian and Northern Affairs, Health Canada and the Department of Fisheries and Oceans to evaluate the risk to health.

#### RELATED PROJECTS:

"Mercury in predatory fish in the Mackenzie River Basin" page 42; "Contaminants and Heavy Metals in Fish from Great Slave Lake and Slave River" page 44; "Yukon Traditional/Country Foods Monitoring Program" page 14; "Changes over time of contaminants found in a Lake Laberge food web" page 12; "Methylmercury Risk Assessment for Arctic Populations" page 122; "Biomarkers of Adverse Developmental Effects in Inuit Infants" page 180.



## Contaminants in Beluga and Ringed Seals from the Canadian Arctic

**Q** Are the levels of persistent organic pollutants in Canadian Arctic beluga and seals changing over time?

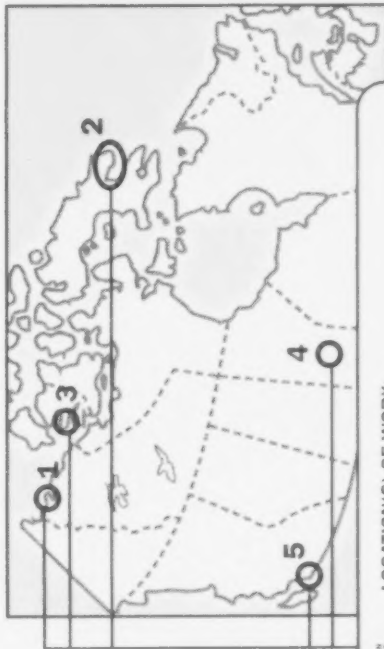
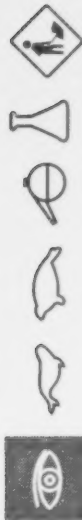
### RELEVANCE:

Inuit communities rely on marine mammals such as whales and seals for a large percentage of their diet. These animals accumulate relatively high levels of **persistent organic pollutants (POPs)** in their bodies because they are high in the marine food chain. Limited information exists on "current use" POPs in the Canadian Arctic - chemicals that are still widely used. These various chemicals are found in plastic materials and are used as flame retardants in many products. The similarity of **polybrominated biphenyls (PBBs)** and **polybrominated diphenyl ethers (PBDEs)** to **PCBs**, which are known to **biomagnify** up the food chain, is a matter of great concern. In addition, **polychlorinated diphenyl ethers (PCDEs)** are also a concern. They are similar in behaviour and toxicity to other environmental contaminants, such as **PCBs** and **DDT** and are being released into the environment. **PCDEs** have been detected at low concentrations in ringed seal and beluga blubber samples. The presence of **PCDEs** in these samples is clear evidence for **long-range transport** through the atmosphere to the Arctic, as there are no significant sources of these **contaminants** in the region. A study of the changes in the levels of these contaminants over time will help in assessing the potential risk to humans of exposure to them. To date, only limited data exist, including temporal trend data, for these "current use" chemicals in Canadian Arctic marine mammals.

### PROJECT SUMMARY:

A number of POPs will be analysed in beluga blubber samples collected from animals at three different locations (Pangnirtung, Kugmallit Bay and Sanikiluaq), and in ringed seal blubber samples collected from Holman Island. These contaminants include **PCBs**, **DDT**, **toxaphene**, **polychlorinated n-alkanes (PCAs)**, **dioxins/furans**, polybrominated diphenyls (**PBBs**) and brominated and chlorinated diphenyl ethers (**PBDEs** and **CDPEs**). In 2002/2003, blubber samples of 40 beluga to be collected from Sanikiluaq (20 samples) and Pangnirtung (20 samples) will be analysed for a large number of these contaminants. No new samples will be collected this year for ringed seal, but 20 blubber samples from 1981, 1991 and 1996 will be analysed for **PBDEs**. This project will help determine whether contaminant levels in Arctic marine animals, and thus exposure to people living in Arctic communities who consume them as part of their traditional diet, are increasing or decreasing with time. These results will also help test the effectiveness of international controls.



**LOCATION(S) OF WORK:**

1. Pangnirtung, Nunavut
2. Sanikiluaq, Nunavut
3. Holman Island, Northwest Territories
4. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba
5. Institute of Ocean Sciences, Department of Fisheries and Oceans, Sidney, British Columbia

**SCHEDULE:**

Beluga blubber samples will be collected this year from Sanikiluaq and Pangnirtung, and analytical results compared to previous years. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2000 - March 2003. One of the project leaders will have visited communities involved in this study in January 2002 as part of an Eastern Arctic Tour. Results will be presented at the Annual **Northern**

**Contaminants Program (NCP)** Symposium, as well as to Nunavut and Inuvialuit agencies. A plain language report will be sent to the Northwest Territories and Nunavut Environmental Contaminants Committees on completion of the project.

**RELATED PROJECTS:**

"Temporal Trends of Mercury in Beluga, Narwhal, and Walrus from the Eastern Arctic" page 62; "Temporal Trends of Persistent Organic Pollutants and Metals in Ringed Seals and Walrus from the Canadian Arctic" page 110; "An early assessment of perfluorinated compounds in the Canadian Arctic" page 112; "Damage to the immune system of ringed seals in the circumpolar Arctic caused by persistent organic pollutants (POPs)" page 78; "Persistent Organic Pollutants (POPs) in Marine Mammals from the Canadian Arctic" page 68; "New Persistent Contaminants of Concern in an Eastern Arctic Marine Food Web" page 82; "The Effects of Prenatal Exposure of Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants" page 88; "Effects of Mixtures of Persistent Organic Pollutants (POPs) on the Immune System of Rats" page 124.



## Mercury in Predatory Fish in the Mackenzie River Basin

**Q** What are the factors that affect the levels of mercury in predatory fish in some lakes of the Mackenzie River Basin, NWT?

### RELEVANCE:

Fish are important for subsistence fisheries and in maintaining cultural values for communities living in the Mackenzie River Basin. Studies have revealed that there are large lake-to-lake variations in **mercury** levels in predatory (fish-eating) fish in lakes in the Mackenzie River Basin. Mercury levels may be high in some lakes due to inputs from inflowing streams and/or from the air, and because of natural characteristics of some of the lakes (and streams), which change mercury into a form that can be absorbed by plants and animals. Therefore, high mercury levels may be a naturally occurring feature of these lakes or they may be due to a more recent event like **long-range transport** through the atmosphere from sources outside the Arctic. This study is designed to investigate what characteristics of lakes are most important for determining mercury levels and sources.

### PROJECT SUMMARY:

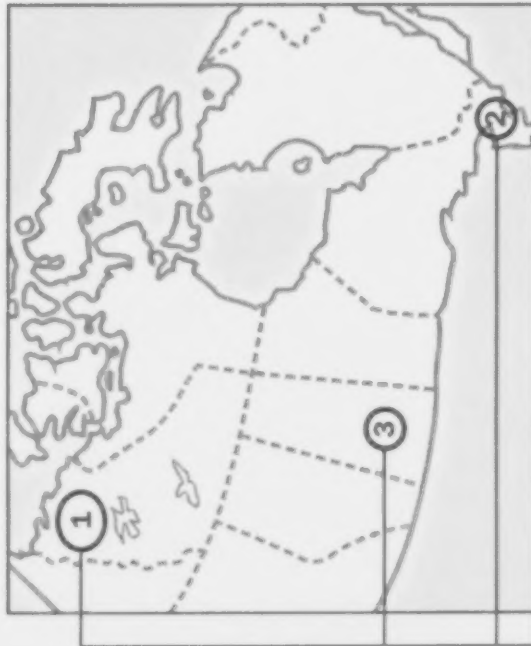
This project has been investigating why some fish-eating fish such as pike (jack), walleye (pickerel), and lake trout in some lakes in the Mackenzie Valley Basin have high levels of mercury. In the lake trout lakes in the Northwest Territories, northern Alberta and Saskatchewan, higher mercury levels are found in smaller lakes with older fish populations, and a similar pattern also appears to occur in pike and walleye lakes in the Northwest Territories. A **food web** approach is being used to assess the **biomagnification** of mercury in predatory fish and sampling has included **benthic** invertebrates (animals without backbones such as clams), **zooplankton**, forage fish, lake sediments and water, as well as predatory fish themselves in these lakes.

This year the project will again focus on lakes in the Fort Simpson area, as well as a site in the Mackenzie River near Fort Simpson or Jean Marie River, to try to explain why mercury levels are higher in some lakes than others. Data sets and archived samples from other projects in the Yukon and Northwest Territories will also be analysed to confirm the possible reasons for lake-to-lake variations in mercury. The role of lake size and fish age will be specifically investigated. The project will also investigate what practical actions might be taken to reduce mercury levels in fish harvested from those lakes containing high levels of mercury.



HG





#### LOCATION(S) OF WORK:

1. A number of lakes in the Mackenzie Valley Basin in the western Northwest Territories, including Reade, Deep, McGill and McEwan lakes, near Fort Simpson and Jean Marie River.
2. National Water Research Institute, Burlington, Ontario
3. National Water Research Centre, Saskatoon, Saskatchewan.

#### SCHEDULE:

The project will be occurring throughout the year. For more information, please contact the project leaders directly.



#### CONTACT INFORMATION:

**Project Leader:** Marlene S. Evans  
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Fax: (306) 975-5143  
E-mail: marlene.evans@ec.gc.ca



#### TIME FRAME:

April 1998 - March 2003. Community members are to be involved in the sampling work, and community presentations are planned. A final community report will be prepared on completion of the study. Results will be presented at the Annual **Northern Contaminants Program (NCP)** Symposium. A National Water Research Institute report will also be prepared.

#### RELATED PROJECTS:

"Contaminants in Burbot from Fort Good Hope, Northwest Territories" page 38; "Yukon Traditional/Country Foods Monitoring Program" page 14; "Contaminants and Heavy Metals in Fish from Great Slave Lake and Slave River" page 44; "Mercury Trends in Arctic Lake Sediments" page 66; "Changes over time of contaminants found in a Lake Laberge food web" page 12; "Methylmercury Risk Assessment for Arctic Populations" page 122.



## Contaminants and Heavy Metals in Fish from Great Slave Lake and Slave River

**Q** Are the levels of persistent organic pollutants and heavy metals in fish species of Great Slave Lake and the Slave River going up or down?

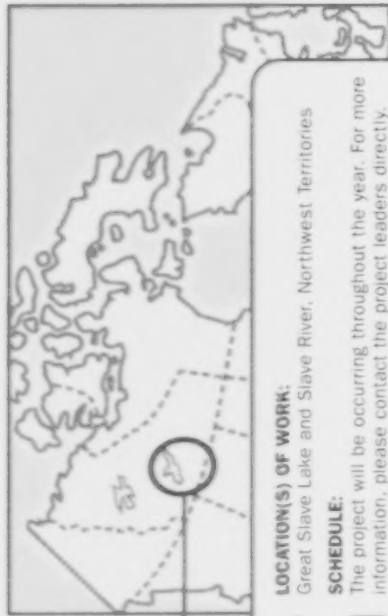
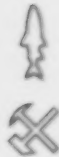
### RELEVANCE:

Changes over time of the **contaminant** levels in fish species in the Mackenzie River Basin are not well known. A long-term **biomonitoring** program is needed to determine contaminant trends and distribution. Long-term biomonitoring addresses the question of whether contaminant levels are increasing or decreasing, and related studies can determine why the changes are occurring. Fish are believed to be the best organisms for biomonitoring contaminant trends in freshwater environments. The project requires that the fish be sampled every year. Great Slave Lake and the Slave River have been selected as study sites for biomonitoring long-term trends in **organic** and **inorganic** contaminants in the Mackenzie River Basin. The reasons for selecting the Great Slave Lake area are the availability of results from previous studies of contaminants in the area, the availability of **archived** fish samples collected during these studies, and general knowledge about the local water system and fish ecology.

### PROJECT SUMMARY:

This project looks at whether (and if so, why) contaminant levels are changing in different regions of Great Slave Lake and the Slave River. In 1999 and 2000, the project studied contaminant levels in lake trout, burbot (loche) and pike (jack) collected by community members from two different areas in Great Slave Lake: the Fort Resolution area and the Lutsel K'e area in the East Arm. So far, fish at Lutsel K'e appear to have lower levels of organic contaminants than those at Fort Resolution. In 2000 and 2001, community members from Fort Smith collected burbot from the Slave River and these are still being analysed.

This year, burbot from the Slave River, and lake trout, pike and burbot from the two locations in Great Slave Lake, will again be collected and analysed. The main emphasis will be on determining levels of **PCBs**, **DDT**, **toxaphene**, **mercury**, **selenium**, and **arsenic**. Some samples will be archived to allow for possible future analyses of **dioxins** and **furans**. Additional samples from Great Slave Lake, caught during 1993-1996, will be analysed for mercury. As in earlier years, this year's work will help determine whether the levels of POPs and metals vary in burbot, lake trout, and pike collected from different parts of Great Slave Lake.



#### LOCATION(S) OF WORK:

Great Slave Lake and Slave River, Northwest Territories

#### SCHEDULE:

The project will be occurring throughout the year. For more information, please contact the project leaders directly.



#### CONTACT INFORMATION:

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#### TIME FRAME:

April 1999 - March 2003. Community visits may take place. A final report will be prepared in 2003 once the project has been completed. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium. The entire set of data and recommendations will be written as a National Water Research Institute technical report to provide a permanent record of the data and its interpretation. At least two scientific papers and recommendations regarding monitoring will be prepared.

#### RELATED PROJECTS:

"Contaminants in Burbot from Fort Good Hope, Northwest Territories" page 38; "Mercury in predatory fish in the Mackenzie River Basin" page 42; "Yukon Traditional/Country Foods Monitoring Program" page 14; "Changes over time of contaminants found in a Lake Laberge food web" page 12; "Denendeh Tour - North Slave and South Slave Regions" page 32; "Methylmercury Risk Assessment for Arctic Populations" page 122.

## Contaminant Transport to the Western Arctic

**Q** What is happening to contaminants in the western Arctic Ocean and where do they come from?

### RELEVANCE:

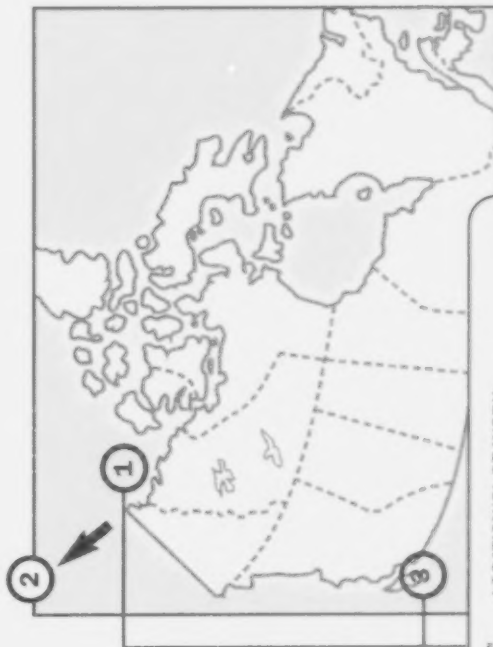
There are large gaps in the knowledge about the transport and fate of **hexachlorocyclohexane (HCH)** contaminants in the western Arctic Ocean. There are two important **isomers** of this contaminant, one of which demonstrates **endocrine-disrupting effects** and is also found in higher levels than the other in human breast milk. It is, therefore, of considerable concern to human health. Some recent studies of bowhead whales from this region have shown seasonal variations in contaminant levels, as the diet of the whales changes during migration from the Bering Sea to the Beaufort Sea. These changes indicate that there are important processes occurring in the western Arctic Ocean which are not yet understood. There is very little data available to evaluate the risks of contaminants to the marine ecosystems. Better computer models are needed to understand better how this contaminant flows into the western Arctic, and what happens to it once it is there.

### PROJECT SUMMARY:

During this project, water samples will be collected at different depths in the Bering Sea and the Beaufort Sea. These samples will be analysed and compared to other data collected since 1986 to determine the levels of two HCH isomers reaching the Beaufort Sea and how these levels change over time. Water data will be compared to atmospheric data to see how long it takes contaminant levels in the water to start decreasing in response to the controls placed on atmospheric emissions. This project will also benefit from oceanographic data being collected under the Canadian - Japanese climate program "Joint Western Arctic Climate Study" (JWACS).

This project's results will help improve the understanding of how the western Arctic has been put at risk from HCH, and how long it is likely to take before levels of industrial chemicals decline in the region. The data collected will also be useful for updating existing models used to assess the effectiveness of international pollution control strategies.



**LOCATION(S) OF WORK:**

1. Beaufort Sea, Northwest Territories
2. Bering Sea, Chukchi Sea, USA/Russia
3. Institute of Ocean Sciences, Department of Fisheries and Oceans, Sidney, British Columbia

**SCHEDULE:**

The project will be occurring throughout the year, with water samples being collected in the Bering and Beaufort Seas in the summer of 2002, and analysed by the end of January 2003. For more information, please contact the project leaders directly.

**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2002 - March 2003. Data from other projects and related to this project will be presented at the

**Northern Contaminants Program (NCP)** Symposium, though data from this study will not be available until later on. A report will be produced upon completion of the project which summarizes the levels of the two HCH isomers in the Bering, Chukchi and Beaufort Seas, and another report will summarize PCB levels from selected sites. Peer reviewed publications are planned that analyse changes in contaminant levels in the ocean in response to atmospheric emission controls; and show the pathways followed by HCHs into the western Arctic Ocean, as well as spatial variations.





## Assessment of Heavy Metal and Radionuclide Levels in Boreal Woodland Caribou, Moose and Dall's Sheep in the Akaitcho Territory, Gwich'in Settlement Area, Sahtu Settlement Area, Deh Cho and Dogrib

**Q** What are the contaminant levels in Dall's sheep, moose, and caribou in the Mackenzie Valley?

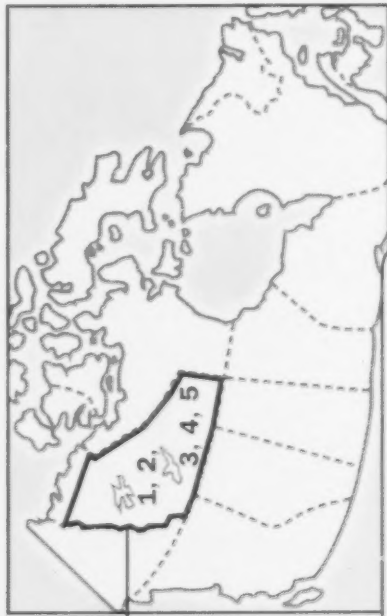
### RELEVANCE:

Contaminant levels in the country foods consumed by Northerners are an important health issue. Boreal woodland caribou, moose, and Dall's sheep have significant cultural value and are major meat sources for many NWT residents. No contaminant sampling has been done on boreal caribou or Dall's sheep in the NWT, and only limited work has been done on moose in the Sahtu. There is a need for current data on **contaminants** in these species.

### PROJECT SUMMARY:

This project will determine whether or not there are any environmental contaminant issues in these three important traditional food species in Denendeh. This assessment will involve a tiered sampling approach. Initial testing will be done on pooled samples (by species and region), with sub-samples from individual animals frozen. If any elevated contaminant levels are detected on the initial screen, banked samples from the species/region in question will be tested individually. This project proposes to collect samples to determine baseline levels of heavy metal, radionuclide and organochlorine contaminants in animals harvested in each region by local hunters. The specific objectives of this project are to determine baseline levels in boreal caribou, moose, and Dall's sheep from all five regions, looking for: metals (**cadmium, lead, mercury, aluminium, nickel, copper, selenium, zinc, arsenic, and uranium**); **radionuclides** ( $^{137}\text{Cs}$ ,  $^{40}\text{K}$ ,  $^{210}\text{Pb}$ ,  $^{210}\text{Po}$ ,  $^{226}\text{Ra}$ , and  $^{238}\text{U}$ ); and **organochlorines**. This baseline information will assist in making decisions on safe consumption levels, requirements for long-term monitoring of contaminant levels in these species, and the effectiveness of current international controls on contaminant emissions. It will provide up-to-date information to regulatory agencies and wildlife co-management boards, and will help assess cumulative environmental effects for these species in Denendeh. This project will also address community concerns in these regions regarding the safety of their traditional diet that includes moose, boreal caribou and Dall's sheep.



**LOCATION(S) OF WORK:**

1. Akaitcho Territory
2. Gwich'in Settlement Area
3. Sahtu Settlement Area
4. Deh Cho Region
5. Dogrib Region

**SCHEDULE:**

For more information, please contact the project leaders directly.

**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2002 - March 2003

**RELATED PROJECTS:**

"Yukon Traditional/Country Foods Monitoring Program" page 14; "Selenium and Cadmium Concentrations in Wild Yukon Mink" page 16; "Persistent Organic Pollutants (POPs) and Metals in Canadian Arctic Fox" page 68; "Contamination Patterns and Trends in Polar Bears across the Canadian Arctic" page 76.



# Nunavut

Photo credit: J. Baizana





Nunavut



## Communication of Information on Dietary Benefits and Risks to Northerners

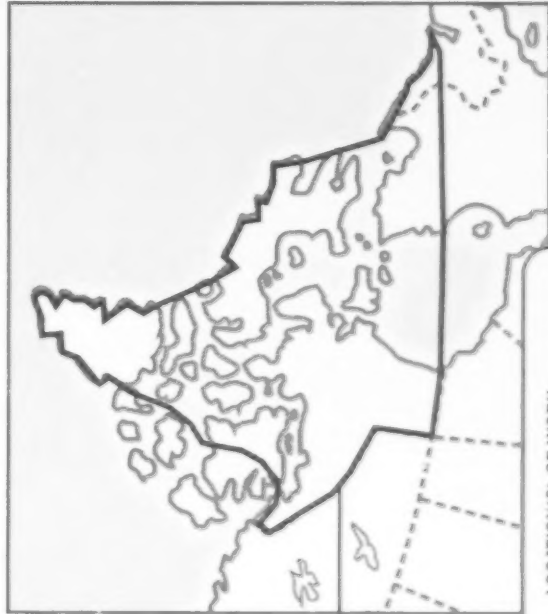
**Q** How will information on the benefits and risks of consuming traditional/country food be communicated to Inuit communities?

### RELEVANCE:

**Traditional/country foods** are central to the values, economy, and physical, social and mental health of Northern communities and individuals, and reflect the close relationship between Northerners and the environment. However, the presence of low levels of **contaminants** in traditional/country food has raised concerns about the potential health risks to **ecosystem** and human health. Therefore, it is important that people become aware of both the benefits and the risks associated with the consumption of traditional/country foods. A major challenge remains for health professionals and Inuit to develop messages that balance the risks associated with contaminants in traditional/country food with the benefits associated with consuming it. The integration of Northern perspectives and knowledge with research information will help in the development of regional specific education/communication packages that will include criteria for community-based research and public health education, and a balanced approach to addressing and communicating benefit-risk information. The Centre for Indigenous Peoples' Nutrition and Environment (CINE) began a **Northern Contaminants Program (NCP)** funded project called **Assessment of Dietary Benefit-Risk in Inuit Communities** in 1997. The data collection phase of this three-year study is now completed. What is now needed is an evaluation of the dietary benefit-risk data by Northerners and the development and implementation of a culturally appropriate communications and education strategy to communicate details of this research to Northern communities.

### PROJECT SUMMARY:

This project will establish a process of "community dialogue" to develop expertise and capacity to develop and convey balanced and informed messages about contaminants, market food, and the important dietary, socio-economic and cultural benefits of country food systems. Community representatives from various regions will participate in evaluating and interpreting the data from the CINE Dietary Benefit-Risk study, leading to the development of culturally sensitive approaches to deliver, communicate and educate Inuit about the results of the study. The "community dialogue" will occur through a workshop in the late fall, meetings with local boards, a newsletter, a regional tour and community involvement through schools. The use of culturally sensitive and practical methods to communicate the results of the CINE study will foster a better understanding and awareness about the study's findings among producers and consumers of traditional/country food. Ultimately, this project will provide Northerners with information on the benefits, risks and the importance of a traditional lifestyle to make informed decisions on harvesting and the consumption of northern foods, and to have more control over contaminants-related issues and problems.



**LOCATION(S) OF WORK:**

Communities throughout the North.

**SCHEDULE:**

For more information, please contact the project leaders.



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**TIME FRAME:**

April 2000 - March 2003.

**RELATED PROJECTS:**

"Relationships Between the Perceived Risk of Eating Contaminated Country Food, Actual Exposure and Health among Nunavimmiut" page 106; "Assessing Awareness, Comprehension and Perception of Contaminants Issues in two Regions of the Canadian North" page 56; "Eastern Arctic Contaminants Tour - Phase IV" page 58.



## Assessing Awareness, Comprehension and Perception of Contaminants Issues in Two Regions of the Canadian North

**Q** How well has information about contaminants been communicated to Northerners?

### RELEVANCE:

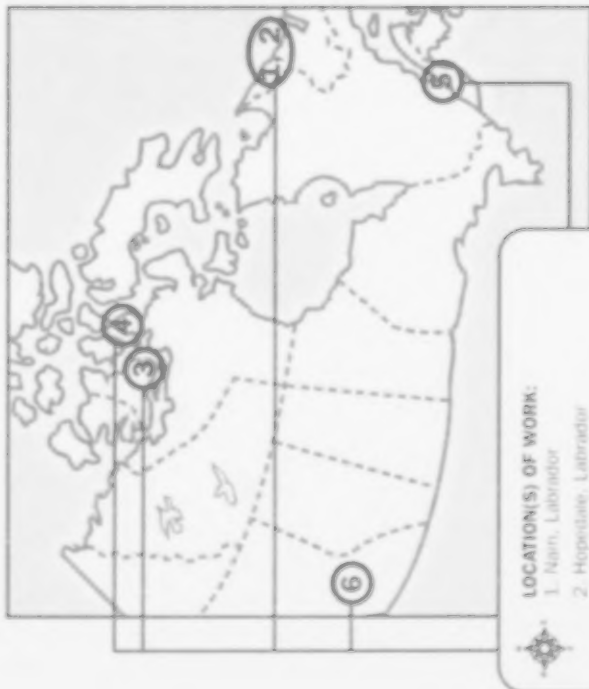
The management and communication of the risks posed by environmental contaminants in the food chain of Northerners is a very challenging issue for health and environmental managers and professionals. **Traditional/country foods** are the anchor to cultural and personal well-being in the North and are particularly essential to the nutritional and social health of Aboriginal peoples. Despite the vital importance of traditional/country food sources, there have been significant changes to the amounts harvested, used and consumed over the past two decades. This reduced harvesting is at least partly due to perceptions of risk associated with **contaminants** in the Arctic ecosystem. Poor communication of contaminant associated risks has been partially responsible for generating these misperceptions which, through unwarranted alteration of consumption patterns, could have an adverse impact on the social, economic and nutritional health of Northerners. To date the **Northern Contaminants Program (NCP)** and its Aboriginal partners and participating researchers have put great effort and resources into communicating with and educating northern communities about contaminants and traditional/country foods. However, only limited attention has been given to formally assessing how Northerners have received and understood this information and how harvesting and consumption patterns may have been affected.

### PROJECT SUMMARY:

This project will evaluate the level of awareness and comprehension of basic contaminants concepts and messages that have been communicated to northern populations through the NCP. It will assess the current perceptions of **food chain** contamination and activities concerning traditional/country foods in four Arctic communities (two each in Nunavut and Labrador). The results will help communicators assess the effectiveness of past communication efforts, identify potential factors influencing this success, and identify needs for improvement that would support informed decision making on these issues.

Specifically, this project will develop, translate into local languages, and administer a short questionnaire to assess the level of awareness and comprehension of basic contaminants information in these communities; compare the perceptions of environmental health risks among these communities; examine the potential factors influencing any differences in levels of awareness, comprehension and risk perception; and identify needs and make recommendations for future communication efforts in these regions of the North. Local research assistants will be hired to help with the delivery of the survey in each of the 4 communities. These individuals will be hired through consultation with regional and community organizations.





#### LOCATION(S) OF WORK:

1. Nain, Labrador
2. Hopeville, Labrador
3. Cambridge Bay, Nunavut
4. Spence Bay, Nunavut
5. Quebec City, Quebec
6. Prince George, British Columbia

#### SCHEDULE:

The project will be ongoing throughout the year. For more information, please contact the project leader directly.



#### CONTACT INFORMATION:

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#### TIME FRAME:

April 2002 - March 2003. Visits will be made to each of four communities to administer the survey and a research assistant will be hired in advance in each community. Results will be communicated during a trip to Cambridge Bay and Nain, and then to the municipal councils and a wider audience using locally appropriate methods. A scientific report and plain language summary will be provided to the Nunavut Environmental Contaminants Committee (NECC) and Nunavut Nutrition and Health Committee (NNHC), and to regional health and environmental organizations upon completion of the project. The results will be written up in the annual **Northern Contaminants Program (NCP)** Synopsis of Research Report, and in scientific publications.

#### RELATED PROJECTS:

"Relationships Between the Perceived Risk of Eating Contaminated Country Food, Actual Exposure and Health among Nunavimmiut" page 106.

## Eastern Arctic Contaminants Tour – Phase IV

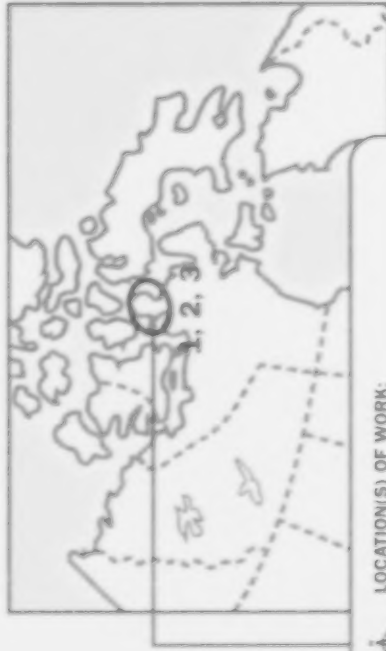
**Q** What can be done to better communicate contaminant information to Eastern Arctic communities?

**RELEVANCE:**

An effective way to communicate **contaminant** research results and information about the **Northern Contaminants Program (NCP)** is to have a small, knowledgeable team of experts spend a few days in a community discussing contaminants and related information with community members. The advantages of hosting workshops in communities are that many community members can be reached and they will hear the message from a source who can answer their questions immediately. Community members are as free as they would be with their families and neighbours to ask questions and raise concerns about contaminants. This approach will also strengthen relationships between community members and NCP representatives, particularly scientists. Previous community tours in the Eastern Arctic have proven to be effective at communicating contaminant related information.

**PROJECT SUMMARY:**

A tour is planned for November 2002 to visit three communities in the Kitikmeot region of Nunavut. Visits are proposed for Pelly Bay, Taloyoak and Gjoa Haven. The tour will involve a team consisting of an NCP representative, an Aboriginal partner, a health specialist and a scientist. Prior to each visit, a community liaison person will be hired to help organize meetings and events, and to provide a point of contact for any further work. The purpose of these visits is to communicate the goals and priorities of the NCP, to discuss current contaminant projects in the area, to listen to the concerns of Nunavut communities about contaminants in the environment, and to assist communities in making informed decisions about the consumption of **traditional/country foods**. The team will also take advantage of the time in the community to meet with the Hunters and Trappers organizations, the Hamlet Council, the schools and any interested groups. With this tour, most communities in the Daffin and Kitikmeot regions will have the opportunity to meet with a diverse team of experts. A trip report will be prepared outlining the comments and concerns raised at each community.

**LOCATION(S) OF WORK:**

1. Pelly Bay, Nunavut
2. Taloyoak, Nunavut
3. Gjoa Haven, Nunavut

**SCHEDULE:**

The tour is scheduled to take place in fall/winter 2002. Prior to the tour, a community liaison person will be hired in each community. For further information, please contact the project leaders directly.

**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2002 - March 2003.

**RELATED PROJECTS:**

"Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)" page 128.



## Nunavut Environmental Contaminants Committee

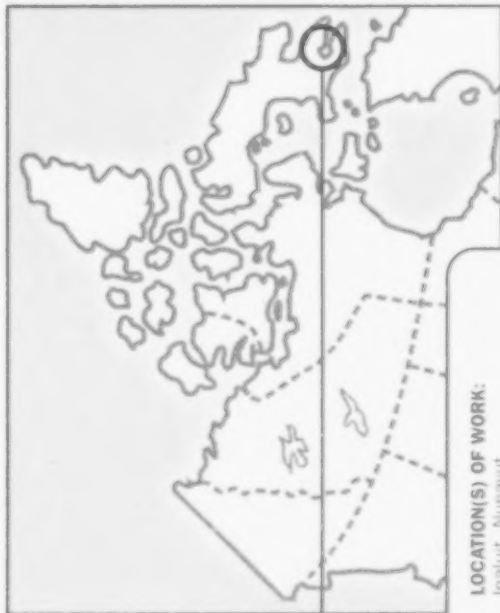
**Q** How can people in Nunavut find out more about contaminants research and become involved in the Northern Contaminants Program?

### RELEVANCE:

Communities in Nunavut are involved with many research and communication efforts under the **Northern Contaminants Program (NCP)**. The Nunavut Environmental Contaminants Committee (NECC) serves the unique interests and concerns of Inuit in Nunavut. It provides residents with an avenue for meaningful input into NCP research and communication activities, a means to develop partnerships with researchers, and a forum to express concerns. The health risks associated with a marine mammal-based traditional diet and the geographically dispersed and isolated Inuit communities are important factors that support a different approach to dealing with contaminant issues in Nunavut. The NECC draws its membership from key public agencies responsible for the management of wildlife harvesting, environmental impact and land use, research, and health issues throughout Nunavut. These agencies liaise directly and frequently with Nunavut communities, which allows the NECC front line access to community concerns, information gaps and research priorities regarding contaminants.

### PROJECT SUMMARY:

The NECC will facilitate the process of collaborative study, assessment, and communication of information to Northerners about the presence and possible effects of contaminants in the environment, including northerners. The NECC will: provide a forum for the two-way transfer of contaminants information between Nunavut residents, researchers, the Northern Contaminants Program (NCP) and other contaminants-related programs; establish a communications network that ensures Nunavut residents are informed and involved in contaminant activities; identify community level priorities and information gaps related to environmental contaminants issues in Nunavut and review the effectiveness of specific NCP communication and education initiatives; act as a clearing house for contaminants information to assist Nunavut residents in making informed decisions about the harvesting and consumption of country foods; provide advice to communities on appropriate funding sources for contaminants research and remediation projects; and review NCP Nunavut proposals prior to full technical reviews. The committee will hold periodic meetings, and the minutes of these meetings can be requested from the NECC chairperson.

**LOCATION(S) OF WORK:**

Iqaluit, Nunavut

**SCHEDULE:**

For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2002 - March 2003.



## Temporal Trends of Mercury in Beluga, Narwhal, and Walrus from the Eastern Arctic

**Q** What are the mercury levels in marine mammals and are these levels changing over time?

### RELEVANCE:

**Mercury** is found in all marine mammal samples analysed to date from the Canadian Arctic. Often, the mercury concentrations found in freshwater fish are well above the level set to protect humans from excessive intakes of mercury. However, there is no comparable standard for mercury in marine mammals (narwhal, beluga, walrus), which are a principal source of traditional/country foods in coastal communities. There is evidence that inputs of mercury to the Arctic through the atmosphere from distant sources are increasing as are the levels found in marine mammals and birds. Mercury found in these animals can be passed to humans through the **food chain**.

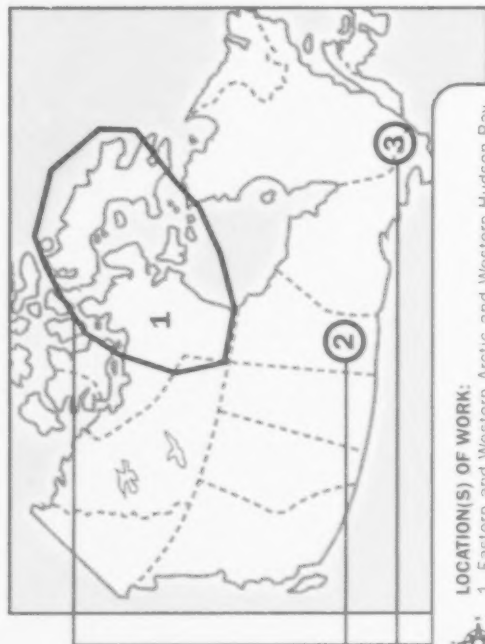
Recent data have shown that whales and seals from the Canadian Arctic live in several non-mixing stocks. Within these stocks the concentration of mercury and other **contaminants** can vary. Results from previous years on this project have led to beluga quotas being lifted for the Iqaluit and Kimmirut areas, and studies are ongoing to determine whether hunted populations of narwhal are sufficiently different to merit treatment as separate stocks. This year the project will acquire additional data on total mercury in tissues of marine mammals from the eastern Arctic so that trends can be measured in individual stocks.

### PROJECT SUMMARY:

This project will investigate changes over time in concentrations of mercury (and to a lesser extent **selenium** and **cadmium**) in tissues of narwhal, beluga and walrus from the eastern Canadian Arctic. This information will also be used to look at levels of mercury on a stock-by-stock basis. Animals of the same species, but of different stocks, spend part of their life in different areas and are, therefore, exposed to different types and levels of contaminants. Differences in contaminant "signatures" between animals of the same species indicate that they are probably from different stocks. This year, archived and newly collected samples of marine mammal livers and kidneys will continue to be analysed for mercury, selenium and cadmium. All the new samples will be derived from hunter kills – no animals will be sacrificed specifically for this work. Archived and/or new samples will be analysed from the following communities and locations: Arctic Bay (narwhal), Grise Fiord (beluga), Pangnirtung (beluga), Igloodik (beluga and walrus), Sanikiluaq (beluga), Iqaluit (beluga), Inukjuak (walrus), Akulivik (walrus) and Hendrickson Island (beluga).



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**LOCATION(S) OF WORK:**

1. Eastern and Western Arctic and Western Hudson Bay, Northwest Territories and Nunavut
2. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba
3. Geological Survey of Canada, Natural Resources Canada, Ottawa, Ontario

**SCHEDULE:**

The project will be occurring throughout the current year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Gary Stern

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**TIME FRAME:**

April 2000 - March 2003. Results will be presented at the Annual **Northern Contaminants Program (NCP)** Symposium, as well as to Nunavut and Inuvialuit agencies. The project will also be written up in the annual Synopses of Research Report and in scientific journals. A plain language report will be sent to the Northwest Territories and Nunavut Environmental Contaminants Committees on completion of the project. Where the results raise questions about human consumption, data will also be communicated to Health Canada to evaluate the risk to health.

**RELATED PROJECTS:**

"Contaminants in Beluga and Ringed Seals from the Canadian Arctic" page 40; "Temporal Trends of Persistent Organic Pollutants and Metals in Ringed Seals and Walrus from the Canadian Arctic" page 110; "Persistent Organic Pollutants (POPs) in Marine Mammals from the Canadian Arctic" page 80; "New Persistent Contaminants of Concern in an Eastern Arctic Marine Food Web" page 82; "The Effects of Prenatal Exposure of Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants" page 88.



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## Temporal Trends of Persistent Organic Pollutants (POPs) and Metals in Landlocked Char

**Q** What are the changes in levels of persistent organic pollutants and heavy metals over time in landlocked char from Amituk Lake, Char Lake and Resolute Lake?

### RELEVANCE:

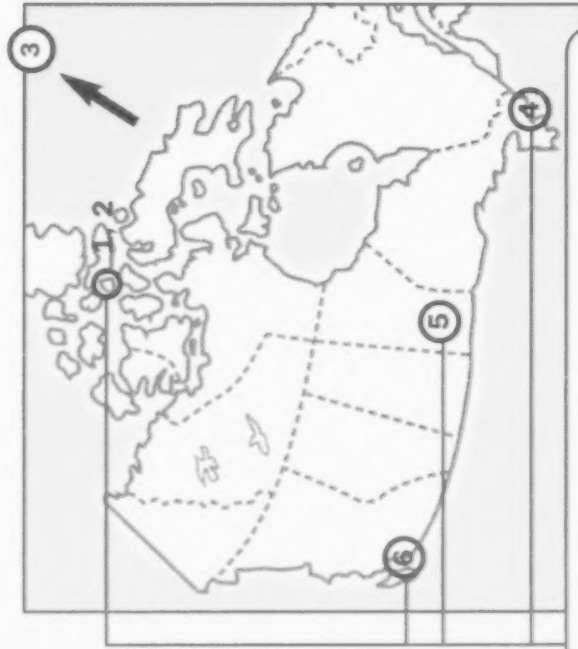
Freshwater fish are exposed to **contaminants** deposited from the atmosphere on snow or directly onto lake surfaces or watersheds. Fish accumulate **persistent organic pollutants (POPs)**, such as **PCBs**, and **heavy metals** such as **mercury**, through their diet and from lake or river water as they pass the water over their gills. Unlike mammals, fish have limited capacity to break down POPs and thus they eliminate many of these chemicals very slowly. Fish are, therefore, good indicators of freshwater contamination by POPs and heavy metals. However, little information on changes to these contaminants in fish is available. Atmospheric levels of many POPs are expected to decline due to the signing of recent international agreements by many countries to reduce their use. If contaminant inputs to the lakes decline, contaminant levels in fish are expected to decline as well, although perhaps more slowly. The analyses of fish may also indicate if levels of other contaminants, not regulated by the above agreements, are increasing. Lakes in the Resolute area are ideal sites for this study – the physical characteristics of the lakes are well known, they are easily accessed by road or helicopter, and the food chain in Char Lake has been well documented.

### PROJECT SUMMARY:

This project began in 1999 to investigate changes in contaminant levels (e.g. mercury and PCBs) over time in Arctic char from Char Lake, Resolute Lake and other lakes near Qausuittuq (Resolute). Char and Resolute Lakes have been selected because of their well-studied landlocked char population. Samples were previously collected from Char Lake in 1992/1993 and most recently from both Char and Resolute Lakes (1997-2001). Char have also been collected from Sapphire Lake (Devon Island), Boomerang Lake (Somerset Island), and North Lake and Amituk Lake (Cornwallis Island). All of the fish collected so far have been analysed for mercury and some POPs. Levels of mercury in the fish in Resolute Lake are relatively low compared to some of the other lakes in the area. PCB levels are too low to be of concern for human health but they do provide information about airborne pollution in the Arctic.

This year, approximately 20 fish from each of Amituk and Resolute Lakes will be collected and analysed, with the end objective of determining whether levels of pollutants are declining or not over a time period of 6-10 years. Paid community participation and training through fish sampling and preparation is an important component of this project.





#### LOCATION(S) OF WORK:

1. Resolute Lake, Cornwallis Island, Nunavut
2. Amittuk Lake, Cornwallis Island, Nunavut
3. Institute of Zoology and Limnology, University of Innsbruck, Innsbruck, Austria
4. National Water Research Institute, Environment Canada, Burlington, Ontario
5. Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba
6. Royal Roads University, Victoria, British Columbia

#### SCHEDULE:

The project will be occurring throughout the year. For more information, please contact the project leader directly.



#### CONTACT INFORMATION:

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#### TIME FRAME:

April 1997 - March 2003. A presentation is planned for the Resolute Bay Hunters and Trappers Association during the summer 2003, and results will also be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsi of Research Report. A draft scientific paper on the temporal trends of contaminants in landlocked char is planned for the end of March 2003 when the project will be completed.

#### RELATED PROJECTS:

- "Mercury Trends in Arctic Lake Sediments" page 66;
- "Regional Contaminants Co-ordinator: Nunavik" page 102;
- "Evaluation of a Risk Management Strategy to Protect Pregnant Women from Contaminant Exposure in Nunavik" page 98.



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## Mercury Trends in Arctic Lake Sediments

**Q** Are the levels of mercury in the Arctic environment increasing?

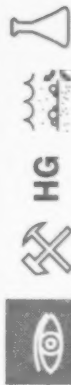
### RELEVANCE:

Heavy metals, particularly **mercury**, have been identified as **contaminants** of concern in the Arctic. Sediment cores taken from the bottoms of northern lakes can be analysed to determine whether the levels of heavy metals deposited in the lakes change over time. The more recent deposits of heavy metals are determined by analysing the top layers of the sediment cores while earlier deposits can be determined from the bottom layers. Many regions lack sediment core analyses of mercury and other heavy metal inputs to northern lakes. For example, there are gaps in the eastern Arctic (Baffin Island) and in northern Québec where no lake sediments have been analysed for mercury contamination.

### PROJECT SUMMARY:

This project will investigate the time trends of mercury as inferred from dated sediment cores collected from a wide range of sites in the Canadian Arctic. Complementary data for lead, manganese and iron will also be produced to understand mercury trends better in the Canadian North. The spatial pattern of contamination across the north may give clues as to the sources of mercury and other metals. Data from sediment cores have been very sparse and this project will help fill this considerable gap in knowledge by investigating several cores from the eastern and western Arctic. Since 2000, the project has analysed 9 cores from small lakes in the Northwest Territories, Nunavut and Nunavik in northern Québec, with additional work in progress. Recent inputs of mercury are evident in all cores. The same is true for lead although inputs are now declining due to its removal from gasoline.

This year, the project will collect cores from only two additional lakes: Char Lake (near Resolute), and in Auyuittuq National Park on Baffin Island.



#### LOCATION(S) OF WORK:

1. Char Lake, Cornwallis Island, Nunavut
2. Auyuittuq National Park, Baffin Island, Nunavut
3. National Water Research Institute, Environment Canada, Burlington, Ontario



#### SCHEDULE:

The project will be occurring throughout the year. For more information, please contact the project leaders directly.



#### CONTACT INFORMATION:

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#### TIME FRAME:

April 2000 - March 2003. The project leaders hope to inform individual communities by including the results of the sediment core analyses in presentations in each community and at regional contaminants workshops. A short report will be sent to the Northwest Territories and Nunavut Environmental Contaminants Committees prior to completion of the project in March 2003. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report.

#### RELATED PROJECTS:

"Temporal Trends of Persistent Organic Pollutants (POPs) and Metals in Landlocked Char" page 64; "Mercury in predatory fish in the Mackenzie River Basin" page 42; "Changes over time of contaminants found in a Lake Laberge food web" page 12;



## Persistent Organic Pollutants (POPs) and Heavy Metals in Canadian Arctic Fox

**Q** What are the levels of persistent organic pollutants (POPs) and heavy metals in the Arctic fox, and do these pose a health risk to the fox?

### RELEVANCE:

The Arctic fox is a circumpolar species widely distributed across northern Canada. It is an economically important species because of its pelt and large numbers of foxes are harvested in both inland and coastal communities. The diet of the fox differs between inland foxes and coastal/island foxes. On land, Arctic foxes feed mainly on lemmings, birds, and eggs, and also scavenge on caribou remains. Coastal foxes eat fish and marine invertebrates in summer, and scavenge the remains of seals and newborn seal pups in winter and spring. Wolverines have similar dietary habits to Arctic foxes including scavenging carcasses, though they are also known to attack and feed on larger game animals. Wolverines near coastal areas may scavenge marine mammal carcasses.

The **Northern Contaminants Program (NCP)** has recommended that exposure to **contaminants** and related health risks be evaluated in species which may have elevated levels of contaminants, but which have not yet been assessed. The Arctic fox is identified as a species for which elevated contaminant levels have been detected elsewhere but no contaminant data exist in Canada. For example, **PCB** levels in Arctic fox in the Norwegian Arctic (Svalbard) have been high enough to suggest that reproduction problems may be of concern due to the **toxic** effects of these contaminants. This is attributed to scavenging on marine mammal carcasses, which have higher levels of **persistent organic pollutants (POPs)** than terrestrial prey.

### PROJECT SUMMARY:

The objective of this project is to determine the levels of POPs and **heavy metals** in Arctic fox which feed in an Arctic coastal environment, and to assess whether or not those levels pose a potential health risk to the Arctic fox. A second pilot study component has the same objectives for wolverine which feed in a coastal environment. No new foxes or wolverines will be collected during this the final year of the project. The 50 fox carcasses collected at Arviat during 2000/2001 will have their livers analysed for metals including **mercury**. Other tissue analyses for POPs, **toxaphene**, **cadmium**, mercury and other metals have already been carried out. Tissue samples from 12 wolverines collected from Kugluktuk (Coppermine) during 1999/2000 have already been submitted for analysis for the same contaminants. The data will be statistically analysed, and the results will be written up.



#### CONTACT INFORMATION:

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#### TIME FRAME:

March 2000 - April 2003. A post-study consultation with the community of Arviat is planned once the contaminant analyses have been completed. Upon completion of the project, the contaminant results will be presented to both communities. Results will be presented at the **Northern Contaminants Program (NCP) Symposium**, and written up in the annual **Synopsis of Research Report**, as well as published in a peer-reviewed scientific journal.

#### RELATED PROJECTS:

"A preliminary assessment of perfluorinated compounds in the Canadian Arctic" page 112.



#### LOCATIONS OF WORK:

1. National Wildlife Research Centre, Environment Canada, Gatineau, Québec
2. National Water Research Institute, Environment Canada, Burlington, Ontario
3. Department of Soil Science, University of Saskatchewan, Saskatoon, Saskatchewan

#### SCHEDULE:

This project will continue through the current year. For more information, please contact the project leaders directly.





## Retrospective Survey of Persistent Organic Pollutants (POPs) in Arctic Seabird Eggs

**Q** Have the levels of persistent organic pollutants in Arctic seabirds increased, decreased, or remained the same since the 1970s?

### RELEVANCE

The Canadian Wildlife Service (CWS) seabird egg monitoring program was established to provide a measure of contamination of the marine **ecosystem** and possible implications for seabird health. The advantage of using eggs to monitor contaminants is that any chemical concentration bias due to sex or season has been eliminated and the age factor has been minimized since only breeding age females lay eggs and all eggs are laid in the spring, within a relatively narrow time window. Seabird eggs provide a good indication of the health of the Arctic marine environment. Monitoring of Arctic seabird eggs from Prince Leopold Island for **persistent organic pollutants (POPs)** and **mercury** has been ongoing since the mid 1970s and all annual surveys of egg samplers have been **archived**. Studies have shown that the changes in contaminant levels observed within the seabird eggs have been due to changes in levels of contaminants in the environment rather than changes in the seabird diet.

### PROJECT SUMMARY

The project will analyse archived Arctic seabird egg contents for **dioxins (PCDDs)**, **furans (PCDFs)**, coplanar **PCBs**, and **polybrominated diphenyl ethers (PBDEs)** in order to determine whether concentrations of these contaminants have changed over the period from 1975 to 1998. For new samples will be collected for this project. Although these eggs have been analysed for other contaminants in the past, they have never been analysed for these chemicals. Since the diets of seabirds in the area under examination have not changed over time, any changes in contaminant trends will reflect changes in contaminant levels in the environment. The seabird eggs to be analysed are those of thick-billed murres, black-legged kittiwakes, and northern fulmars collected from Prince Leopold Island in the Canadian High Arctic. The chemical analysis results will be statistically analysed to determine whether contaminant levels have changed over the period, and the project will be written up for publication.



#### LOCATIONS OF WORK

National Wildlife Research Centre  
Environment Canada, Gatineau, Quebec

#### REMARKS

For more information, please contact  
the project leader directly.



#### CONTACT INFORMATION:

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#### TIME FRAME:

April 2001 - March 2003. The contaminants data along with a plain language summary of the project findings will be submitted to the Nunavut Environmental Contaminants Committee for review. The Committee will also be asked about the most appropriate way to communicate the results back to the communities. Should there be a tour of Arctic communities in 2002/2003, plain language visual information may be prepared for presentation during this tour. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report, as well as published in a peer-reviewed scientific journal.

#### RELATED PROJECTS:

"A preliminary assessment of perfluorinated compounds in the Canadian Arctic" page 112.



## Northern Contaminants Air Monitoring: Persistent Organic Pollutant Measurements

**Q** What levels of persistent organic pollutants (POPs) are entering the Arctic from the air?

### RELEVANCE

Most of the **persistent organic pollutants (POPs)** found in the Arctic are transported by air from sources outside the Arctic. Monitoring the levels of **contaminants** in air is necessary to assess any changes in the types and amounts of contaminants transported to the Arctic over time. This study is part of an ongoing monitoring program begun in 1992, which continues to be used to support negotiations for international controls on the use of POPs, and to monitor if those controls are working. Under the **Northern Contaminants Program (NCP)**, levels of contaminants in the Arctic atmosphere have been collected for many years from three Canadian air monitoring stations: Alert, Igloolik, Cape Dorset, and more recently from two stations in Russia (Dudinka Island and Anzherma). The results from all five stations will be used to test computer models of atmospheric chemical transport by comparing actual measured levels of contaminants in the air with the levels predicted by the models. Some of the models have been developed to explain how contaminants "hop" from their sources in warm parts of the world to colder regions, such as the Arctic, where they can accumulate.

### PROJECT SUMMARY:

This final phase of the project will focus on a continuation of measurements at Alert as the baseline site, to measure the occurrence of selected POPs and **polycyclic aromatic hydrocarbons (PAHs)** in parallel with identical measurements in western Russia. Measurements will also continue to be made at Kinngait (Cape Dorset), to ensure that results are available for different sites in the Arctic. A third site will be re-established for a one-year period at Little Fox Lake near Whitehorse in the Yukon. Data from this site will help in assessing the impacts of trans-Pacific transport of contaminants from Asia to the Canadian Arctic, as well as in determining changes in contaminant levels in the western Arctic since 1993/1994. In addition, comparisons will be made between the 1994-1996 and 2000-2002 data sets at Kinngait; a manuscript will be prepared on the spatial differences of contaminant levels between several of the stations, and transport and removal processes of **PCBs** will be investigated, using the extensive air-monitoring database.





#### LOCATION(S) OF WORK:

1. Alert, Northern Esquimaux Island, Nunavut
2. Kinngait (Cape Dorset), Southern Baffin Island, Nunavut
3. Little Fox Lake, Yukon
4. Dorset Island, Yukon
5. Amderma, Russia
6. Frechetville Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba
7. Meteorological Service of Canada, Environment Canada, Toronto, Ontario

#### SCHEDULE

The project will continue through the current year with samples being collected weekly. For more information, please contact the project leader directly.



#### CONTACT INFORMATION:

**Project Leader:** Pierrette Blanchard  
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Environment Canada  
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#### TIME FRAME:

April 1992 - March 2003. Upon completion of the work at Kinngait in October 2002, a communication strategy will be developed in collaboration with the Nunavut Environmental Contaminants Committee (NECC) and with the Inuit Tapiriit Kanatami. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopses of Research Report, as well as published in scientific journals.

#### RELATED PROJECTS:

- Atmospheric Mercury Measurements at Alert" page 74;
- Mercury Measurements at Amderma, Russia" page 132;
- An early assessment of perfluorinated compounds in the Canadian Arctic" page 112; "A Comprehensive Theoretical Study of Organic Contaminants as Influenced by Falling Snow and Seasonal Snow Cover" page 136; "Scientific Evidence to Support International and Regional Control Initiatives for Persistent Organic Pollutants (POPs) and Mercury" page 138;
- Facilitation of International Action related to the Long-Range Transport of Contaminants into the Arctic" page 144.



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## Atmospheric Mercury Measurements at Alert

**Q** How much mercury is transported to the Arctic through the atmosphere?

### RELEVANCE:

There is a great deal of evidence of contamination of the Arctic ecosystem by persistent, **bioaccumulating, toxic** substances, including **heavy metals** such as **mercury**. Mercury is a **contaminant** of concern in the North because it builds up in Arctic **food chains**. The metal is naturally present in Arctic rocks, soils and vegetation, but it is also released to the environment through human activities, especially in southern regions. Mercury can be transported from distant sources to the Arctic in the atmosphere, where it is found as mercury vapour or attached to tiny airborne particles. Mercury vapour generally stays airborne for months at a time, but particles can be deposited much more readily onto the land. Most of the particles are deposited with falling snow or rain or directly from the air itself.

### PROJECT SUMMARY:

The principal objective of this project is to determine trends in atmospheric concentrations and deposition patterns of mercury in the Arctic over time. Mercury in the atmosphere has been measured at Alert since 1995 and will continue to be measured this year at Alert in the air particles and snow. Results from this ongoing study will help determine if atmospheric concentrations of mercury are increasing or decreasing in the Northern Hemisphere and how much is being: (a) transported by the atmosphere and (b) deposited onto the snow/ice/ground surfaces and vegetation in the Arctic. This information will lead to better computer models of the atmospheric transport of mercury into the Arctic, as well as help establish a sound scientific basis for addressing gaps in our knowledge of the behaviour of mercury in the Arctic environment. It will also support international actions to reflect the appropriate environmental protection goals and control strategies.

**CONTACT INFORMATION:**

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**TIME FRAME:**

April 1995 - March 2003. In the spring of 2002 a three-week field study will be conducted at Alert to test the methodology and to take new mercury measurements. The project team will participate in awareness and promotional activities of the **Northern Contaminants Program (NCP)** and plain language summaries will be provided to the Nunavut Environmental Contaminants Committee. A number of contaminant reports, publications and computer models, as well as peer-reviewed journal papers, will be produced by the time of project completion. Results will also be presented at the Northern Contaminants Program (NCP) Symposium, and written up in the annual Synopsis of Research Report.

**RELATED PROJECTS:**

"Northern Contaminants Air Monitoring: Persistent Organic Pollutant Measurements" page 72; "Mercury Measurements at Andorra, Russia" page 132; "An early assessment of perfluorinated compounds in the Canadian Arctic" page 112; "A Comprehensive Theoretical Study of Organic Contaminants as Influenced by Falling Snow and Seasonal Snow Cover" page 136; "Scientific Evidence to Support International Regional Control Initiatives for Persistent Organic Pollutants (POPs) and Mercury" page 138; "Facilitation of International Action related to the Long-Range Transport of Contaminants into the Arctic" page 144.



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## Contamination Patterns and Trends in Polar Bears Across the Canadian Arctic

**Q** What is the geographic pattern of contamination in polar bears across the Canadian Arctic, and how has this changed over the last decade?

### RELEVANCE

The polar bear is at the top of the Arctic marine food chain and contains some of the highest levels of contaminants found in the Arctic. The polar bear is important in Inuit culture and is eaten in some communities. There are, therefore, significant concerns about the effects of these contaminants for both the polar bears and the humans who consume them. Although the levels of **organochlorine contaminants** have been monitored in Hudson Bay polar bears throughout the 1990s, there has not yet been a comprehensive study on the geographic distribution of organic contaminants, or of **heavy metals**, in Canadian polar bears since the late 1980s and early 1990s. Some newer contaminants, e.g. **PFA's**, have not yet been measured in polar bears but also could be of concern.

### PROJECT SUMMARY:

This project will analyse fat and liver samples from individual polar bears from across the Canadian Arctic for a series of **persistent organic pollutants (POPs)** and metals known to be important contaminants in the environment. These POPs include **DDT**, **PCBs**, **toxaphene**, **chlorodanes**, as well as a number of others including "new" POPs such as **PFA's** which are now being recognized as of importance in the environment. The samples will also be analysed for some 23 different metals including **mercury**. Stable **isotopes** of nitrogen and carbon in polar bear muscle will also be analysed to compare the diets of polar bears from one region to another. This information will help contribute to understanding variations in contaminant levels among polar bear populations.

This work will fill an important data gap that has existed since the early 1990s. The results of the current project will be compared to the earlier work to see if there have been changes over the past 10 years or so. No new polar bears will be harvested for this study. Instead, samples will be obtained from animals already harvested in Nunavut and the Northwest Territories in the 2001/2002 season.



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#### LOCATION(S) OF WORK:

1. Buffalo Island, Nunavut
2. Resolute Bay, Nunavut
3. Southern Baffin Bay, Northwest Territories
4. Western Hudson Bay (near Churchill), Manitoba
5. National Water Research Institute, Burlington, Ontario
6. Great Lakes Institute for Environmental Research, Windsor, Ontario
7. National Wildlife Research Centre, Sudbury, Quebec

#### SCHEDULE:

Fieldwork has already taken place in 2001/2002. Chemical analysis will have been completed early in 2003, with results and interpretation completed by the end of March 2003. For more information, please contact the project leaders directly.



#### CONTACT INFORMATION:

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#### TIME FRAME:

April 2002 - March 2003. A report will be produced on the spatial and temporal trends of contaminant levels in Canadian polar bears. This report will be provided to community representatives, and to the Northwest Territories and Nunavut Environmental Contaminants Committees. Preliminary results will be presented at the **Northern Contaminants Program (NCP)** Symposium, written up in the annual Synopses of Research Report, and published in scientific papers.



## Damage to the Immune System of Ringed Seals in the Circumpolar Arctic Caused by Persistent Organic Pollutants (POPs)

**Q** Are persistent organic pollutants affecting the immune system of ringed seals in the Arctic?

### RELEVANCE:

The immune system is designed to protect an organism from disease. Environmental contaminants can disrupt the immune system, making it difficult for the system to recognize and respond to the agents that cause disease. Eventually the organism can suffer from a disease called autoimmune dysfunction, whereby the immune system starts to attack the organism's own molecules or tissues. There is considerable evidence from studies in the south that environmental contaminants play a strong role in the development of autoimmune dysfunction in humans. Some recent studies show that contamination from POPs is affecting the immune systems of Arctic polar bears, but there are as yet no studies of other Arctic species including the ringed seal. Any changes that occur in the health of the seals could affect both polar bears and the lifestyle of many Arctic peoples, as the ringed seal is an important component of their diet.

### PROJECT SUMMARY:

Ringed seals are being collected as part of the traditional hunt in the Cumberland Sound area, and blood from approximately 100 of these seals will be analysed for signs of autoimmune dysfunction. The analysis will focus on detecting antinuclear antibodies in the seals' blood and the results will be compared to similar analyses for seals from Alaska, and from Svalbard, Norway and the Baltic Sea. As levels of contamination are generally lower in Alaska than in Cumberland Sound, and higher in Norway and the Baltic Sea, the study will also look at whether there is a relationship between levels of contamination and the degree to which autoimmune dysfunction is found.

An important element of this project is the paid involvement of hunters from Pangnirtung to collect seal blood and canine teeth, and to document information about the size and sex of each seal. The Pangnirtung Hunters and Trappers Association will be responsible for organizing the shipment of samples to the laboratory for analysis.



#### LOCATIONS OF WORK

1. Caribou Island, Nunavut
2. Pangnirtung Hunters and Trappers Association, Pangnirtung, Nunavut
3. National Science Museum Institute, Environment Canada, Burlington, Ontario
4. Arctic, USA
5. Northwest and Arctic Sea, Norway

#### NOTES

Work started will be continued during the Caribou Island Survey in May, June and July of 2002. The laboratory analyses and interpretation will take place in the latter part of 2002. For more information, please contact the project leaders directly.



#### CONTACT INFORMATION:

**Project Leader:** Norm Neumann  
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#### TIME FRAME:

April 2002 - March 2003. A bilingual (English and Inuktitut) poster will be provided to the Pangnirtung Hunters and Trappers Association in early 2003. Preliminary results will be presented at the **Northern Contaminants Program (NCP)** Symposium, and also provided to the Pangnirtung Hunters and Trappers Association along with a summary.

#### RELATED PROJECTS:

"Contaminants in Beluga and Ringed Seals from the Canadian Arctic" page 40; "Temporal Trends of Persistent Organic Pollutants and Metals in Ringed Seals and Walrus from the Canadian Arctic" page 110; "Persistent Organic Pollutants (POPs) in Marine Mammals from the Canadian Arctic" page 80; "The Effects of Prenatal Exposure of Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants" page 88; "Effects of Mixtures of Persistent Organic Pollutants (POPs) on Reproduction and Health in Pigs and Rats" page 124; "Effects of Mixtures of Persistent Organic Pollutants (POPs) on the Immune System of Rats" page 118.

## Persistent Organic Pollutants (POPs) in Marine Mammals from the Canadian Arctic

**Q** What are the levels of new contaminants of concern in marine mammals in different parts of the Canadian Arctic?

### RELEVANCE

and thus contamination of these mammals is a potential health concern. There is only limited knowledge about the levels in Arctic marine mammals of some of the new contaminants, e.g., **metabolites of PCBs and polychlorinated biphenyl ethers (PBDEs)**, though these are known to have **endocrine-disrupting effects**. In particular, some of the metabolites are known to be highly persistent, and strongly disrupt thyroid hormones. The work presented here will help in assessing inuit exposure to PCB and PBDE metabolites through their diet, and to identify particular marine mammal species of concern.

### PROJECT SUMMARY

A variety of marine mammals in the eastern Arctic, including beluga, walrus, ringed seals, and narwhal will be analysed for metabolites of PCBs and PBDEs. No new marine mammals will be collected for this study, as archived blood and liver samples are already available. These samples will be analysed for changes in contamination levels over time to help predict whether some marine mammals may pose a future health risk. Several species are being investigated, since they have different eating patterns, and metabolise chemicals differently. There may, therefore, be considerable variability in the levels of contamination from species to species.

The information generated from this study is expected to be of considerable value to Aboriginal people, as many of the marine mammals being examined are part of their traditional diet. The results should also lay the foundation for future work on the **toxicity** of specific metabolites.







#### SAMPLING OF BIRDS

1. Beaufort Sea, Northwest
2. Foul Bay, Northwest
3. Hudson Bay, Northwest
4. Foul Bay, Northwest
5. Foul Bay, Northwest
6. Foul Bay, Northwest

#### NOTES

Samplers have already been collected. Samples of the samples will start immediately and be completed by March 2003. For more information please contact the project leader directly.

#### CONTACT INFORMATION:

**Project Leader:** Gregg, Tony  
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#### TIME FRAME:

April 2002 - March 2003. Reports will be produced on the levels of these "new contaminants" in marine mammal foods. Results of this work will be communicated to the residents of Iqaluit on a timely basis (to be arranged with guidance from the Nunavut Environmental Contaminants Committee (NECC)). A plain language report summarizing the results will also be made available and submitted to the NECC. A report will be made to the **Northern Contaminants Program (NCP)** Symposium and published in the annual **Synopsis of Research Report**.

#### RELATED PROJECTS:

"Contaminants in Beluga and Ringed Seals from the Canadian Arctic" page 40; "Temporal Trends of Mercury in Beluga, Narwhal, and Walrus from the Eastern Arctic" page 62; "Temporal Trends of Persistent Organic Pollutants and Metals in Ringed Seals and Walrus from the Canadian Arctic" page 110; "Damage to the immune system of ringed seals in the circumpolar Arctic caused by persistent organic pollutants" page 78; "New Persistent Contaminants of Concern in an Eastern Arctic Marine Food Web" page 82.



## New Persistent Contaminants of Concern in an Eastern Arctic Marine Food Web

**Q** To what extent are new persistent organic pollutants found in marine mammals, fish and other organisms in the eastern Arctic?

### RELEVANCE

There is very limited knowledge about the concentrations of environmental (persistent) organic pollutants (POPs) found in eastern Arctic biota. There is no readily available information about the **bioaccumulation** through the **food web** of some of the new persistent contaminants of concern such as **perfluorinated acids (PFAs)** or **polychlorinated naphthalenes (PCNs)** (which are listed as priority for research, transformers, cables and wires as well as e-labourers, fungicides and insecticides). The presence of these compounds in Arctic wildlife may be significant as they may affect the function of the liver and gut biotransformation, leading to liver cancer.

### PROJECT SUMMARY

This project is expected to improve the knowledge about the levels of some of the new persistent organic pollutants found in eastern Arctic marine wildlife and how they bioaccumulate through the food web. Archived muscle, liver and/or blubber samples from beluga, narwhal, walrus, Arctic cod, deep-sea redfish, shrimp and zooplankton collected in the Davis Strait will be analysed for PFAs and PCNs, as well as for certain types of PCNs and PCBs. Most of these samples were collected in 2000 or 2001, though the walrus samples are from 1992. The project will try to explain the mechanisms for the bioaccumulation and transfer of these chemicals in the food web, as well as establish baseline levels which can be used by future studies.

The information generated from this study is expected to be of significant value to Aboriginal people, as many of the wildlife species being examined in this study are part of their traditional diet. It is also expected to contribute to the formulation of Canadian positions on these compounds at international meetings to control emissions.



STUDY 1

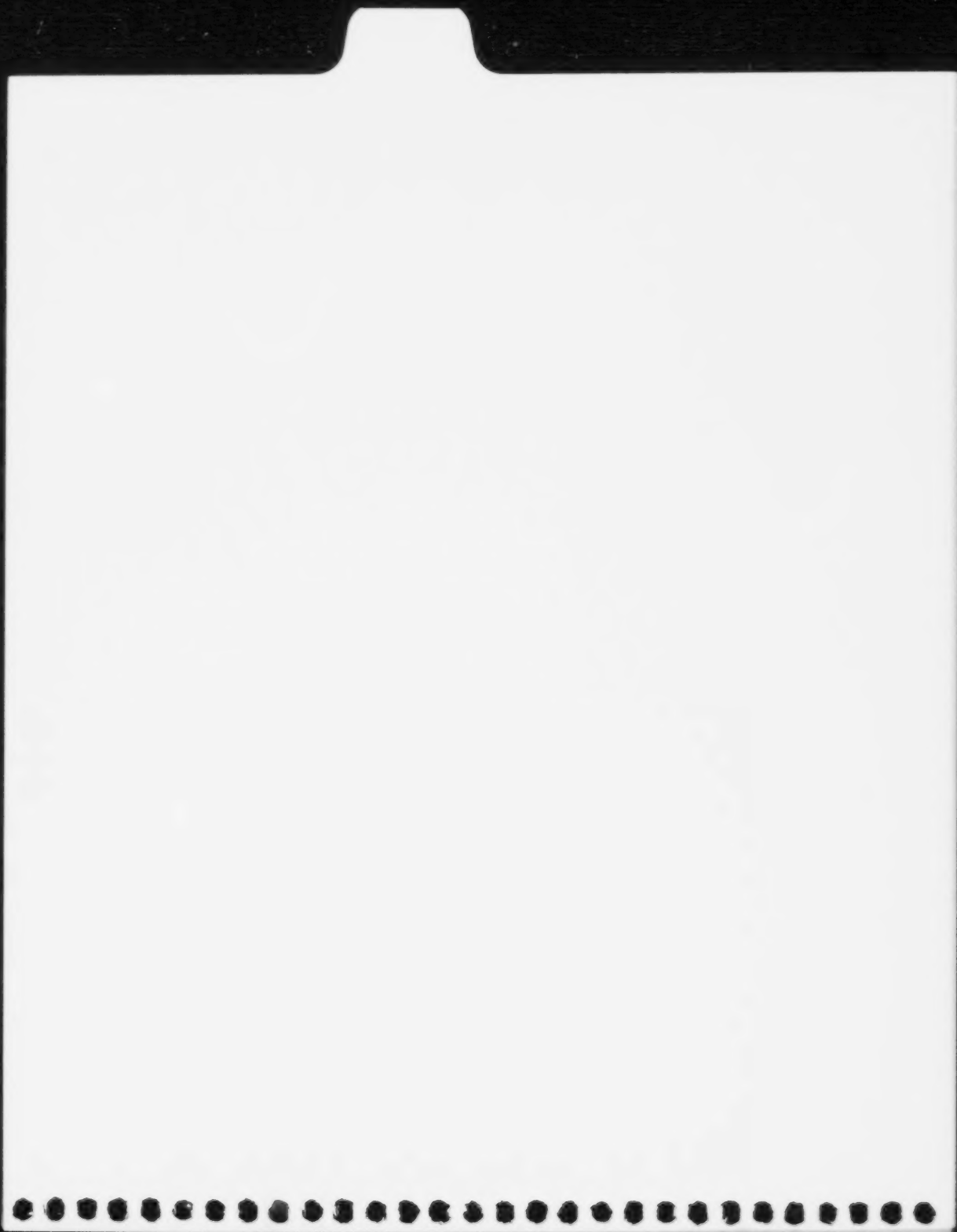




# Nunavik/Labrador

Nunavik/  
Labrador

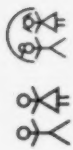




Nunavik/Labrador



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## The Effects of Prenatal Exposure to Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants

**Q** What is the relationship between resistance to infection or disease and early exposure to persistent organic pollutants and mercury?

### RELEVANCE:

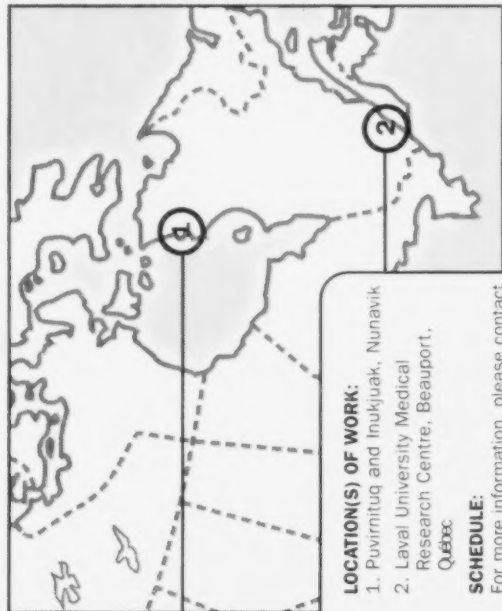
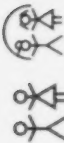
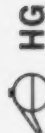
**Persistent organic pollutants (POPs)** and **mercury** reaching the Northern regions by **long-range transport**, are known to **biomagnify** through aquatic **food chains** to reach relatively high levels in top predator species such as polar bear, beluga and seals. The Inuit of Nunavik rely heavily on marine foods for their subsistence, particularly the fat of ringed seal and beluga. The relationship between exposure to such **contaminants** and the incidence of infectious diseases is still hypothetical but these contaminants have been shown to have **immunotoxic** properties in laboratory animals and in humans. Therefore, these contaminants could play a role in the unusually high incidence of infectious diseases in Northern communities. These contaminants can be transferred from the mother to the foetus during pregnancy, and to the infant through breast milk. The exposure of infants to these contaminants, both before and after birth, may reduce their ability to resist disease through the depression of their **immune systems**.

### PROJECT SUMMARY:

The project will examine the effects of prenatal and postnatal exposure to POPs and mercury on the immune system of Inuit infants, from birth to 12 months of age. Specifically, the project will assess prenatal and postnatal exposure of infants to POPs and mercury, determine the incidence of infectious diseases among Inuit infants, assess their Vitamin A status (a deficiency in Vitamin A is a factor associated with infectious disease), and evaluate their immune system function. Immune system function will be evaluated using the level of antibody produced by the infant following *Haemophilus influenza* immunization; the level of proteins which protect the infant against infections (complement system) before the infant's immune system is fully developed; and the level of chemical messengers which enable the various cells of the immune system to communicate with each other.

Approximately 200 Inuit mothers and their newborns from Nunavik have been involved in the study. The mothers were recruited during pregnancy and their infants were assessed at 6 and 12 months of age. Information on contaminants and on the immune system is being obtained through analyses of maternal and cord blood samples, breast milk, and peripheral blood samples collected from infants at 6 months of age. The infectious disease incidence is being evaluated through a medical chart review. This will be the last year for completing this study. Proposed work will concentrate on completing the data analysis, reporting and communication of results.



**LOCATION(S) OF WORK:**

1. Puvirnituq and Inukjuak, Nunavik
2. Laval University Medical Research Centre, Beauport, Québec

**SCHEDULE:**

For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Éric Dewailly  
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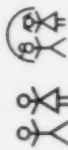
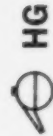
E-mail: [eric.dewailly@crchul.ulaval.ca](mailto:eric.dewailly@crchul.ulaval.ca)

**TIME FRAME:**

April 1998 - March 2003. This is the final year for this project. A trip to the communities to collect any additional data may take place in summer 2002 if required. Up-to-date reports will be presented to the **Northern Contaminants Program (NCP)**, and to the Nunavik Nutrition and Health Committee. Final results will be made available upon completion of the project. Final reporting will include a plain language report as well as scientific articles for publication in peer reviewed journals. Results of this and other related projects will be communicated directly with project participants and Nunavik communities.

**RELATED PROJECTS:**

"Prenatal Exposure to PCBs and Mercury and Infant Development in the Inuit" page 90; "Exposure of Preschool Aged Inuit Children to PCBs and Methylmercury (Follow-up)" page 92; "PCBs and Development of the Nervous System" page 96; "Biomarkers of Adverse Developmental Effects in Inuit Infants" page 100.



## Prenatal Exposure to PCBs and Mercury and Inuit Infant Development

**Q** Do PCBs and mercury produce harmful effects in Inuit infants as a result of prenatal exposure?

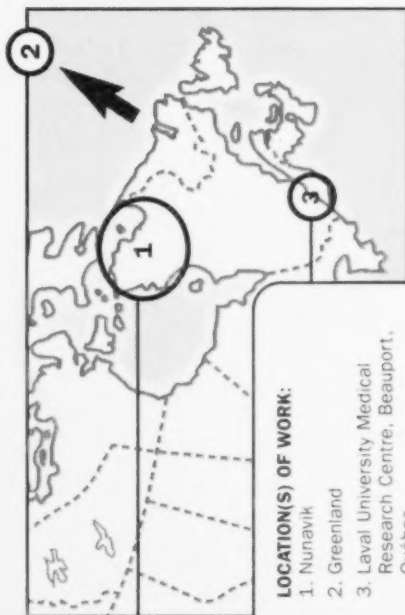
### RELEVANCE:

Polychlorinated biphenyls (PCBs) and **mercury** have made their way to the Arctic through the atmosphere and the ocean, and have **bioaccumulated** in **traditional/country foods** such as fish and marine mammals. PCBs and mercury from local sources may also contribute to **contaminant** levels in the Arctic environment. Studies in other countries have linked prenatal exposure to PCBs and mercury to adverse neurological effects in people. The current project will seek to determine if Inuit infants exposed to PCBs and mercury in the womb or through breast milk, are being adversely affected. Elevated levels of PCBs and mercury have been reported in Inuit newborns and adults in Nunavik. The research will provide the opportunity to assess the impacts of human exposure to environmental contaminants over time.

### PROJECT SUMMARY:

This project, which started in 1995 and will conclude in 2003, examines the consequences of prenatal exposure to PCBs and mercury on the health of Inuit infants from Nunavik and Greenland at birth, at 6.5 months and at 11 months of age. It will investigate the impact of PCBs and mercury exposure on thyroid hormones, physical growth, physical and neurological maturity, and overall health, mental, motor and neurobehavioural development. The proposed project will reproduce and extend previous studies by using a cohort (group) of infants more highly exposed to the contaminants, and by using new tests that have been linked to specific brain regions and neural pathways. These new tests have the potential to provide information on possible mechanisms of action.

In addition to the effects of contaminants, other factors that might affect the newborn, such as the mother's diet and lifestyle, are being considered. An important issue in the study is the level and source of psychological distress among Nunavik mothers whose children might be affected by environmental contaminants. This will be the final year for this project; primary tasks will involve final data analysis and reporting. An extensive communications plan is also planned for this year that will address numerous audiences in Nunavik and internationally.



## LOCATION(S) OF WORK:

1. Nunavik
2. Greenland
3. Laval University Medical Research Centre, Beauport, Québec

### SCHEDULE:

The project will take place throughout the year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

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This project is supported by: the Nunavik Nutrition and Health Committee, the mayors, municipal councils, health committees and women's groups of the northern villages of Inukjuak, Puvirnituq, Salluit, Kuujuaq, and Kuujuaq, the Pauktuutit Inuit Women's Association, Nunallitigait (Ikaluqatiglut Inuit Association), Ungava Tulatavik Health Centre, Inuitsiwiik Health Centre, and the Nunavik Regional Board of Health and Social Services.

## TIME FRAME:

November 1995 - March 2003. Communication of results will be a focus of this year's work and will target a multitude of audiences primarily in the regions involved with the study. Up-to-date reports will be presented to the **Northern Contaminants Program (NCP)**, and to the Nunavut Nutrition and Health Committee. Scientific papers will be published in peer reviewed international journals.



### RELATED PROJECTS:

"The Effects of Prenatal Exposure of Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants" page 88; "Exposure of Preschool Aged Inuit Children to PCBs and Methylmercury (Follow-up)" page 92; "PCBs and Development of the Nervous System" page 96; "Biomarkers of Adverse Developmental Effects in Inuit Infants" page 100.



## Exposure of Preschool Aged Inuit Children to PCBs and Methylmercury (Follow-up)

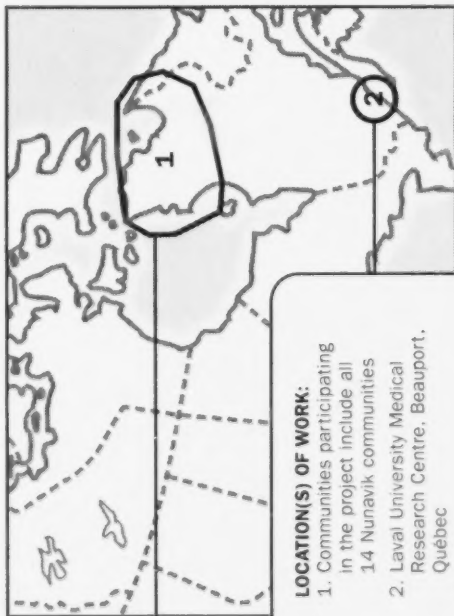
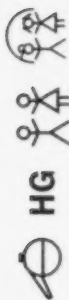
**Q** Are Inuit children of preschool age experiencing effects from exposure to PCBs and methylmercury?

### RELEVANCE:

The effects of prenatal exposure of children to polychlorinated biphenyls (**PCBs**) and **methylmercury** as a consequence of diet have been studied in fish-eating populations in a number of countries, and other regions in Canada. Prenatal exposure to PCBs has been linked to deficits in neurobehavioural development during infancy. However, only two studies have provided data for school-age children and these studies did not provide information on those aspects of brain development related to learning difficulties and disabilities. In the Nunavik Inuit population, prenatal exposure to PCBs and methylmercury can result from a maternal diet of certain fish and sea mammals. This study will determine if children exposed to these **contaminants** in the womb, or through mother's milk, are showing any effects as they develop to the preschool age (age 5).

### PROJECT SUMMARY:

This project is examining the long-term consequences of prenatal exposure to PCBs and methylmercury on aspects of brain development (including neuromotor and neurophysiological effects) in Inuit children. This study has examined 104 Inuit children from Nunavik, aged 4.5 years. Prenatal exposure to both PCBs and methylmercury was documented from cord blood analysis at birth. (Since 1993, under the Nunavik Cord Blood Surveillance Program, prenatal PCBs and methylmercury exposure has been documented for almost all Nunavik newborns.) The research extends previous findings in this area by examining the impact of exposure to contaminants on various brain functions that could be related to learning difficulties and disabilities. This will be the final year for this project in which primary tasks will involve final data analysis and reporting. An extensive communications plan is also planned for this year that will address numerous audiences in Nunavik and internationally.



**LOCATION(S) OF WORK:**

1. Communities participating in the project include all 14 Nunavik communities
2. Laval University Medical Research Centre, Beauport, Québec

**SCHEDULE:**

For more information on the project, please contact the project leader directly.



**CONTACT INFORMATION:**

**Project Leader:** Gina Muckle  
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**TIME FRAME:**

November 1995 - March 2003. Communication of results will be the focus of this year's work and will target a multitude of audiences primarily in the regions involved with the study. Reports will be presented to the Nunavik Nutrition and Health Committee. Scientific papers will be published in peer reviewed international journals.



**RELATED PROJECTS:**

"The Effects of Prenatal Exposure of Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants" page 88; "Prenatal Exposure to PCBs and Mercury and Infant Development in the Inuit" page 90; "PCBs and Development of the Nervous System" page 96; "Biomarkers of Adverse Developmental Effects in Inuit Infants" page 100.



## Determinants of Food Choices in Labrador

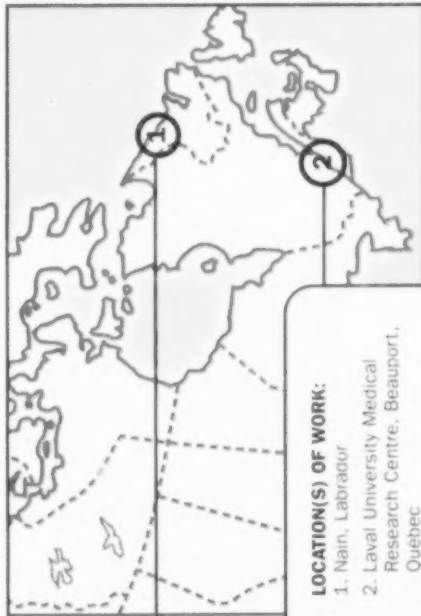
**Q** What determines food choices in Labrador and how can health professionals protect and promote nutritional health and well-being in Northern populations?

### RELEVANCE:

Traditional Inuit diets are based on **traditional/country foods** that provide high nutritional benefits. These diets are associated with a low incidence of cardiovascular heart disease, diabetes and some **cancers** in Inuit populations. In recent years, however, information about the potential health risks associated with the presence of **contaminants** in northern wildlife has increased greatly. For decades (partly in response to concerns about food contaminants) Inuit have been replacing or supplementing their traditional diet with some nutrient-poor store-bought foods. These dietary changes have affected the health of Inuit and lead to increases in diabetes, cardiovascular heart disease, and diet-related nutritional deficiencies. The incidence of these diseases can be expected to increase and cause additional health problems in the future. Choice of diet can reduce adverse health risks. A better understanding of the factors that influence diet choice can assist health professionals in protecting and promoting nutritional health and well-being among Inuit populations.

### PROJECT SUMMARY:

This project will address the needs of northern health professionals to promote healthy food choices. This will be accomplished by identifying factors that influence the food choices of individual Inuit who are faced with changes in the types of food available for consumption. The project will provide a better understanding of food preferences, attitudes and other determinants of current Inuit diet behaviour through the development and application of a survey tool in Nain, Labrador. This survey tool will raise awareness of what determines food choices in Labrador, and compare the results to those of similar surveys conducted in Nunavik and Alaska. The survey tool will also be tested for cross-cultural effectiveness in these regions. The project proposes to support the role of Inuit health organizations – such as the Labrador Inuit Health Commission (LIHC) – government agencies, and advisory bodies in developing education, communication, and health-promotion activities on traditional/country foods, nutrition and health.



**LOCATION(S) OF WORK:**

1. Nain, Labrador
2. Laval University Medical Research Centre, Beauport, Québec



**SCHEDULE:**

The project will be carried out over a two-year period. For more information on the project, please contact the project leader directly.



**CONTACT INFORMATION:**

**Project Leader:** Chris Furgal  
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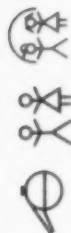


**TIME FRAME:**

April 2001 - March 2003. The survey tool was developed in the first year and will be applied to study communities this year.

**RELATED PROJECTS:**

"Completing CINE Data and Reports from Three Major Dietary Studies" page 126.



## PCBs and Development of the Nervous System

**Q** Do PCBs in the Inuit diet produce adverse effects on the development of the nervous system?

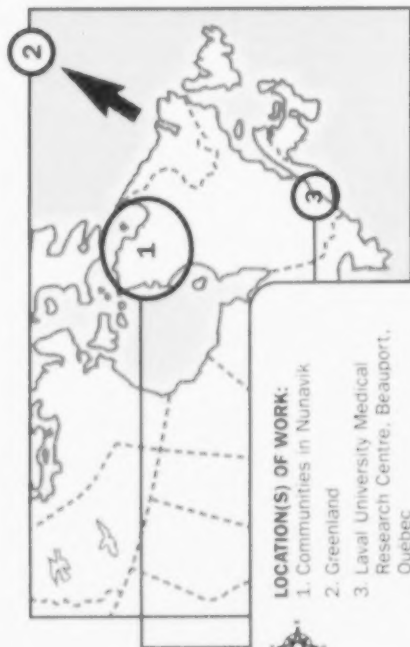
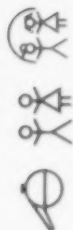
### RELEVANCE:

Previous studies have linked prenatal exposure to **polychlorinated biphenyls (PCBs)** to delayed gross motor development and to deficits in physical growth and cognitive development. The **Northern Contaminants Program (NCP)** is funding an ongoing cohort (group) study (see "Prenatal Exposure to PCBs and Mercury and Infant Development in the Inuit" page 90) on **contaminants** and potential adverse effects on infant development. This study involves the participation of approximately 300 Inuit infants and their mothers from Nunavik and Greenland to investigate the impact of PCB and **mercury** exposure on thyroid hormones, physical growth, physical and neurological maturity, overall health, and aspects of brain development and function. Recent data indicate that hydroxylated **metabolites** of PCBs that accumulate in the blood could be responsible for these adverse effects by affecting thyroid hormone levels in the newborn.

### PROJECT SUMMARY:

The project will examine the role of certain metabolites of PCBs in producing adverse effects on the development of the nervous system in Inuit through interaction with the thyroid hormone pathway. The project will measure **halogenated phenolic compounds** in cord blood plasma samples that have been **archived** in the cohort study. Thyroid hormone levels in maternal and cord blood, as well as in infants' blood, are already being measured in the cohort study. This new information on exposure of infants to halogenated phenolic compounds will be compared with neurodevelopment information for these newborns to determine if the PCB metabolites are affecting the development of their nervous system. This research will also provide the opportunity to study for the first time the occurrence of "new contaminants" that have not been measured in the environment and which could be linked to adverse health effects in the Inuit population.





#### LOCATION(S) OF WORK:

1. Communities in Nunavik
2. Greenland
3. Laval University Medical Research Centre, Beauport, Québec



#### SCHEDULE:

This is the second year for this project which is associated with an ongoing cohort study involving Inuit children in Nunavik and Greenland. For more information on the project, please contact the project leader directly.



#### CONTACT INFORMATION:

**Project Leader:** Pierre Ayotte  
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#### TIME FRAME:

April 2001 - March 2003. Communication of results of this study will be co-ordinated with an overall communication strategy for the long term cohort study, "Prenatal Exposure to PCBs and Mercury and Infant Development in the Inuit." The study will be carried out with the co-operation of the Nunavik Nutrition and Health Committee. Yearly reports will be produced and made available to the Northern Contaminants Program (NCP), and scientific papers will be submitted to peer-reviewed publications.



#### RELATED PROJECTS:

"The Effects of Prenatal Exposure of Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants" page 88; "Prenatal Exposure to PCBs and Mercury and Infant Development in the Inuit" page 96; "Exposure of Preschool Aged Inuit Children to PCBs and Methylmercury (Follow-up)" page 92; "PCBs and Development of the Nervous System" page 96; "Biomarkers of Adverse Developmental Effects in Inuit Infants" page 100.



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## Evaluation of a Risk Management Strategy to Protect Pregnant Women from Contaminant Exposure in Nunavik

**Q** Could a program that promotes the consumption of Arctic char by pregnant women reduce exposure to methylmercury?

### RELEVANCE:

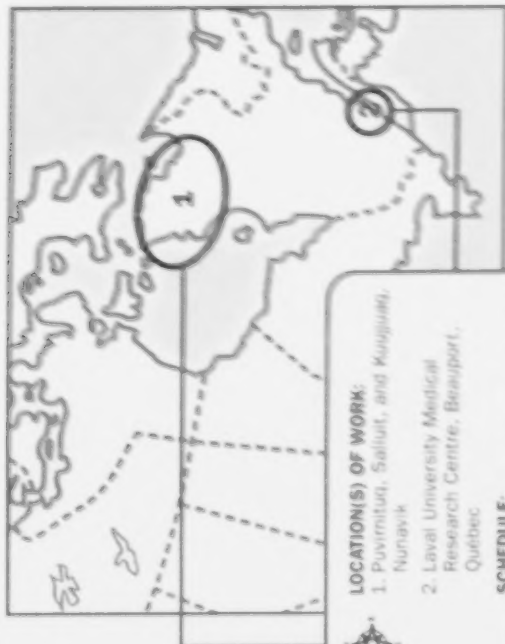
**Mercury and persistent organic pollutants (POPs)** are contaminants of concern to public health in the Canadian Arctic. It is well known that continuous exposure to elevated levels of these contaminants can be harmful to the central nervous system, especially in early developmental life stages. Most at risk from these potential effects are the developing foetus and infants. One way to reduce contaminant exposure at this critical life stage is to limit the amount of contaminant intake through the diet of the mother. Reducing contaminants in the diet can be achieved by avoiding or limiting the consumption of **traditional/country food** items which are known to contain the highest levels of contamination, primarily marine mammals and lake trout. It is also well known, however, that the harvesting and consumption of these species is extremely important both nutritionally and culturally to northern people. If consumption of these foods is to be limited, a viable alternative must be available such that the overall cultural and nutritional value of the diet is not compromised. One suggestion is to promote the consumption of Arctic char as a way of reducing exposure. Arctic char not only contains very low levels of contaminants, it is also highly nutritious and popular among northern people.

### PROJECT SUMMARY:

The objectives of this study are to 1) test the feasibility and acceptability of a program aimed at promoting the consumption of char by pregnant women, 2) efficiently decrease mercury intake among pregnant women by 70% by the last trimester of pregnancy, 3) slightly decrease **PCB** exposure during pregnancy and 4) improve the nutritional status of expectant mothers during the duration of pregnancy.

This project will require the volunteer participation of 30 women in three communities, ten in Puurmittuq, ten in Salluit, and ten in Kuujuaq. In co-operation with the local Hunters Support Program and Municipal offices approximately 3 medium size char (~3lbs each) will be supplied to each of the participating women on a weekly basis during pregnancy. Samples of blood and hair will be collected from the women at the beginning of pregnancy and at the time of delivery. These samples will be analysed for contaminants (**methylmercury** and **PCBs**) as well as nutrients and fatty acids.

Observations on the collection, storage and distribution of the char will also be recorded to identify potential challenges to the program. The women will also be interviewed to evaluate the acceptability of the program, actual levels of char consumption, additional challenges they faced and general desirability of the program.



#### LOCATION(S) OF WORK:

1. Puurmittut, Salluit, and Kuujuaq, Nunavut
2. Laval University Medical Research Centre, Beauport, Québec

#### SCHEDULE:

This project will be carried out over a one-year period. For more information on the project, please contact the project leader directly.

#### CONTACT INFORMATION:

**Project Leader:** Eric Dewailly  
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#### TIME FRAME:

April 2002 - March 2003. Promotional pamphlets will be distributed in the communities to assist in recruiting participants. Results will first be communicated to the Nunavut Nutrition and Health Committee after which they will be communicated in plain language to the participants of the study and community members. Mid- and final-year reports as well as communications material will be produced for use by NNHC and NCP. Results will also be written up for publication by NCP and peer reviewed journals.

#### RELATED PROJECTS:

"Effects of Prenatal Exposure to OCs and Mercury on the Immune System of Inuit Infants" page 88; "Follow-up of Pre-school Aged Children Exposed to PCBs and Mercury Through fish and Marine Mammal Consumption" page 92; "Completing CINE Data and Reports from Three Major Dietary Studies" page 126.



## Biomarkers of Adverse Developmental Effects in Inuit Infants

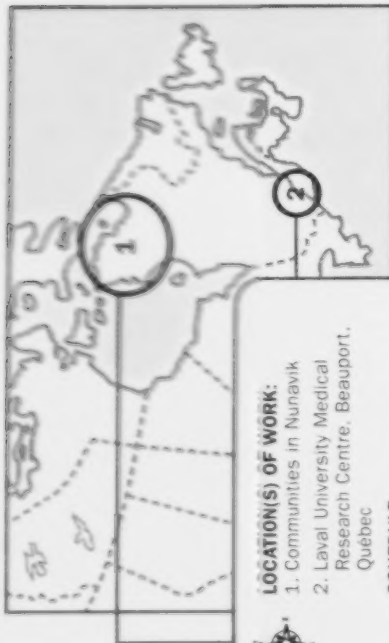
**Q** Can certain biological compounds help in the early detection of contaminants and related effects?

### RELEVANCE:

**Persistent organic pollutants (POPs)** such as **PCBs** and **pesticides** have been found at elevated concentrations in fish and mammals of the Canadian Arctic. There is concern that exposure to these contaminants through the consumption of traditional/country foods could have adverse effects on the early life-stage development of human infants. So far these effects and the amount of contaminant exposure required to trigger them are not very well understood. It is also difficult to distinguish between health effects caused by contaminants and effects caused by lifestyle habits such as smoking or drinking alcohol. One method of studying these effects is by looking at what scientists call **biomarkers**. A biomarker is a certain biological element that undergoes change when exposed to a stressor, such as chemical contaminants. Looking for changes in certain biomarkers allows scientists to identify very subtle effects of contaminant exposure which are not necessarily harmful, but could forewarn of other effects if the exposure increased. Biomarkers are also specific to certain types of stress or contaminants making it easier to identify the cause of the change in the biomarker. A better understanding of biomarkers provides a kind of biological early warning system that will lead to more accurate information about contaminants and their potential effects.

### PROJECT SUMMARY:

The main objective of this study is to relate biomarker changes in Inuit women to their exposure to contaminants as well as lifestyle habits (smoking and alcohol consumption). The set of biomarkers that will be studied are detoxifying enzymes found in the placenta. The contaminants that will be looked at have all originated from sources outside of the Arctic and include **PCBs**, **organochlorine pesticides** as well as **dioxins** and **furans**. The analysis for these contaminants has already been done or is being done as part of related studies under the **Northern Contaminants Program (NCP)** and biomarker analysis will be carried out on placental samples that have already been collected. Information about personal lifestyle habits, also collected as part of these related studies, will be used to relate biomarker results to smoking and drinking alcohol. The results of this study will help to explain findings of another ongoing study that is looking at possible contaminant related effects on infant development. The study will also try to identify certain aspects of the enzyme system that might help reduce the adverse effects of contamination.



**LOCATION(S) OF WORK:**

1. Communities in Nunavut
2. Laval University Medical Research Centre, Beauport, Québec



**SCHEDULE:**

This is a new project that will make use of samples and results from other related studies involving Inuit women in Nunavut. For more information on the project please contact the project leader directly.



**CONTACT INFORMATION:**

**Project Leader:** Daria Pereg  
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**TIME FRAME:**

April 2002 - March 2003. The study will be carried out with the co-operation of the Nunavut Nutrition and Health Committee and Health Canada. Yearly reports will be produced and made available to the **Northern Contaminants Program (NCP)**, and scientific papers will be submitted to peer-reviewed publications.



**RELATED PROJECTS:**

"Effects of Prenatal Exposure to OCs and Mercury on the Immune System of Inuit Infants" page 88; "Prenatal Exposure to PCBs and Mercury and Inuit Infant Development" page 90; "Exposure of Preschool Aged Inuit Children to PCBs and Methylmercury (Follow-up)" page 92; "PCBs and Development of the Nervous System" page 96.



## Regional Contaminants Co-ordinator: Nunavik

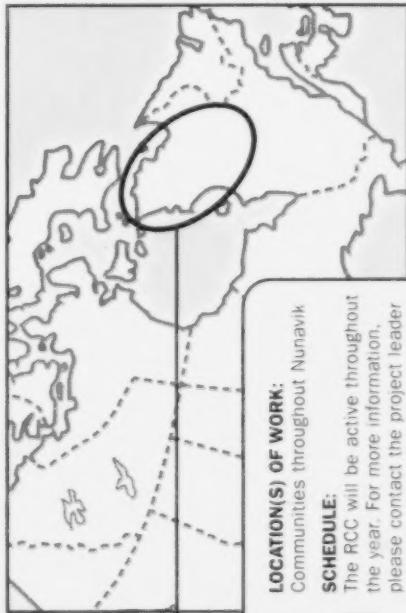
**Q** How can we better communicate information on contaminants research with communities in Nunavik?

### RELEVANCE:

Nunavik has a long history of dealing with **contaminant**-related issues and supporting research. The Nunavik Nutrition and Health Committee (NNHC) (originally named the **PCB** resource Committee) was established in 1988 to deal with issues related to food, contaminants, the environment and health in Nunavik. Since its inception, the NNHC has broadened its perspective to take a more holistic approach to environment and health issues inclusive of both benefits and risks. The NNHC acts as the authorized review and advisory body for the health and nutrition issues in the region and includes representation from many of the organizations and agencies concerned with these issues, as well as those conducting research on them. The Regional Contaminants Co-ordinator (RCC) is an integral member of this Committee, co-ordinating the activities and operation of their work and acting as a member on the Committee.

### PROJECT SUMMARY:

The Nunavik RCC will help co-ordinate research and communication activities in Nunavik through the Nunavik Nutrition and Health Committee. This individual will be an integral front line contact for many ongoing research projects, liaising with researchers both within and outside the region, helping respond to regional concerns and questions regarding contaminant related matters, and supporting the timely and effective communication of research results to communities. As well, the RCC will act as a contact person in the region for communications within the **Northern Contaminants Program (NCP)**. Communication activities that the RCC will help facilitate will focus on results of ongoing research, information on projects being conducted in the region and promoting the benefits of a traditional diet. A major focus of this years communications activities will be presentation of the **Canadian Arctic Contaminants Assessment Report II**.

**LOCATION(S) OF WORK:**

Communities throughout Nunavik

**SCHEDULE:**

The RCC will be active throughout the year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:****Project Leader:** Minnie Grey

Chairperson

Nunavik Nutrition and Health Committee (NNHC)

Executive Director

Nunavik Regional Board of Health

and Social Services

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**TIME FRAME:**

April 2001 - March 2003.

**RELATED PROJECTS:**

"Regional Contaminants Co-ordinator: Sahtu Dene Council" page 24; "Regional Contaminants Co-ordinator: Labrador Inuit Association" page 104; "Regional Contaminants Co-ordinator: Dogrib Treaty 11 Council" page 26; "Regional Contaminants Co-ordinator: Inuvialuit Settlement Region" page 28; "Regional Contaminants Co-ordinator: Gwich'in Tribal Council" page 30; "Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)" page 128.

## Regional Contaminants Co-ordinator: Labrador Inuit Association

**Q** How can we better communicate information on contaminants research with communities in Labrador?

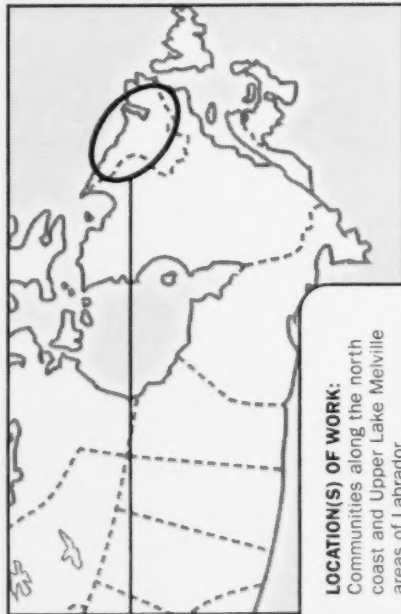
### RELEVANCE:

Labrador Inuit depend on fish and wildlife for food and are aware of the presence of **contaminants** in the environment affecting these food sources. This awareness of human-made chemicals entering the environment is a cause for concern and Labrador Inuit are requesting that information be communicated in an appropriate, culturally sensitive and accurate format so they are able to make informed decisions about their health and environment. The Labrador Inuit Association Research Office strives to continue this communication effort on contaminants, research and the environment in the communities and to conduct research to promote mutually beneficial relationships between the communities of northern Labrador and outside researchers and scientists.

### PROJECT SUMMARY:

The Regional Contaminants Co-ordinator (RCC) will continue to provide information from research on contaminants and their effects on the environment and human health so that Labrador Inuit can make informed decisions regarding the food they eat. The RCC will take into account the different languages and needs of individuals and communities of Labrador including those along the north coast communities and in the Upper Lake Melville area. Various methods will be used to communicate research results and information about the benefits of traditional/country foods as well as the potential risks of contaminants. Methods of communication will include workshops, open houses and training sessions. The RCC will also help communities identify and prioritize contaminants issues and assist in communicating community concerns and priorities to the appropriate authorities. The RCC will also be responsible for assisting outside researchers with community consultations including negotiating ethical and effective research agreements and reporting project results to communities. A major focus of communication activities this year will be the **Canadian Arctic Contaminants Assessment Report II**.



**LOCATION(S) OF WORK:**

Communities along the north coast and Upper Lake Melville areas of Labrador.

**SCHEDULE:**

The RCC will be active throughout the year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Mary Denniston  
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Labrador Inuit Association  
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Nain, Labrador  
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Fax: (709) 922-1040  
E-mail: natsiq@nunatsiavut.com

**TIME FRAME:**

April 1997- March 2003.

**RELATED PROJECTS:**

"Regional Contaminants Co-ordinator: Nunavik" page 102;  
"Regional Contaminants Co-ordinator: Sahtu Dene Council" page 24;  
"Regional Contaminants Co-ordinator: Dogrib Treaty 11 Council" page 26;  
"Regional Contaminants Co-ordinator: Inuvialuit Settlement Region" page 28;  
"Regional Contaminants Co-ordinator: Gwich'in Tribal Council" page 30;  
"Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)" page 128.



## Relationships between the Perceived Risk of Eating Contaminated Country Food, Actual Exposure, and Health among Nunavimmiut

**Q** How does risk perception associated with contaminants in traditional/country foods affect actual food consumption? What are the best ways to communicate the relative benefits and risks of traditional/country food consumption?

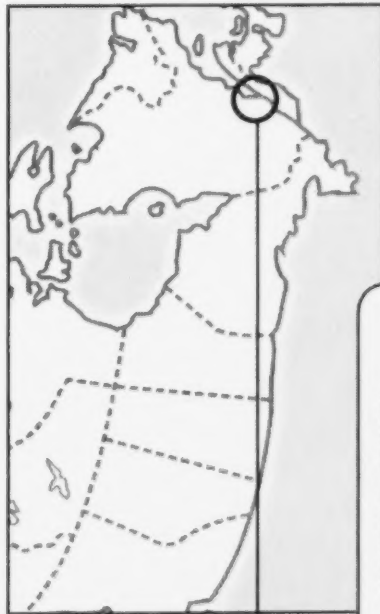
### RELEVANCE:

**Traditional/country foods** are central to the values, economy, and physical, social and mental health of Inuit communities and individuals, and reflect the close relationship between Inuit and the environment. Moreover, the act of hunting, processing, sharing and consuming traditional/country foods adds to their psychological and spiritual well-being. At the same time, traditional/country food is the primary route by which Inuit are exposed to most persistent **contaminants**. Strong evidence indicates there has been a decrease in the consumption of traditional/country foods by Inuit and that this may be partly due to a fear of contaminants. In the past, ambiguous messages that had been communicated to Inuit regarding the safety of traditional/country food resulted in unnecessary confusion, anxiety, and changes in consumption patterns and areas harvested. This experience demonstrated a need to improve our understanding of the relationships between the perceptions of contaminants, what is causing these perceptions, actual country food consumption, and aspects of social and mental health in Inuit communities. Such an understanding can help improve how health advisories and other information concerning contaminants and traditional/country foods are communicated to Inuit.

### PROJECT SUMMARY:

This project will examine the relationships between the perceptions Inuit have regarding the risk of contaminants in traditional/country food, actual food consumption, actual exposure to these contaminants, and factors which influence their social and mental health. The focus will be on Inuit in the Nunavik region. To date, only qualitative information is available on these relationships but this study will provide quantitative data for these issues by analysing existing data for the Inuit of Nunavik collected in the Santé Québec health survey in 1992 and data currently being collected about (Nunavik) Inuit infants and their mothers. No new surveys or data collection will be carried out in this project.

The project will demonstrate whether the risk of food contamination is perceived similarly or differently among different social, economic and demographic subgroups of the Inuit population. The relationship between these perceptions and actual food consumption will be very useful in understanding how the same communication strategies are received in different communities and by different individuals. This, in turn, will help provide public health and environment officials and policy makers with information to consider when developing effective risk communication strategies.

**LOCATION(S) OF WORK:**

Québec City, Quebec

**SCHEDULE:**

The project will be ongoing throughout the year. For more information, please contact the project leaders directly.

**CONTACT INFORMATION:**

**Project Leaders:** Christopher Furgal and Carole Blanchet  
Public Health Research Unit  
Laval University Medical Research Centre  
Centre Hospitalier Universitaire de Québec (CHUQ)  
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Carole.Blanchet@crchul.ulaval.ca

**TIME FRAME:**

April 2002 - March 2003. Data analysis will start in spring 2002. The results will be presented in plain language to the Nunavik Nutrition and Health Committee (NNHC) during a trip to Kuujuaq. Input from the NNHC will inform how results are to be disseminated more widely in Nunavik. The results will be written up in the annual **Northern Contaminants Program (NCP)** Synopsis of Research Report, and in scientific publications.

**RELATED PROJECTS:**

"What determines food choices in Labrador and how can health professionals protect and promote nutritional health and well-being in Northern populations?" page 94; "Evaluation of a Risk Management Strategy to Protect Pregnant Women from Contaminant Exposure in Nunavik" page 98; "Nunavik Nutrition and Health Committee Communications and Co-ordination Program" page 108.

## Nunavik Nutrition and Health Committee Communications and Co-ordination Program

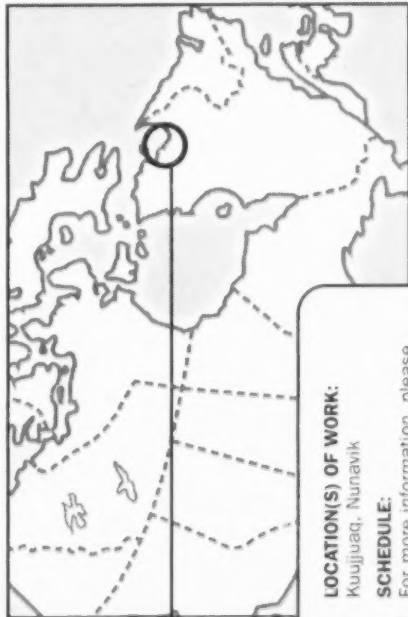
**Q** How can people in Nunavik find out more about contaminants research and become involved in the Northern Contaminants Program?

### RELEVANCE:

The Nunavik Nutrition and Health Committee (NNHC) was established in 1988 (as the **PCB** Resource Committee) to deal with issues related to food, **contaminants**, the environment and health in Nunavik. Since its inception, the NNHC has broadened its perspective to take a more holistic approach to environment and health issues inclusive of both benefits and risks. The NNHC acts as the review and advisory body for the health and nutrition issues in the region, and includes representation from many of the organizations and agencies concerned with these issues. The NNHC provides guidance and acts as a liaison for researchers and agencies, from inside and outside the region; directs work on priority issues; communicates with and educates the public on health and environment topics and research projects; and represents Nunavik residents' interests at the national and international levels. All activities are conducted with the goal to protect and promote public health in Nunavik, through more informed personal decision-making.

### PROJECT SUMMARY:

The general objective of this project is to address regional communication needs and provide information necessary for the public understanding of data relevant to environmental health and contaminants issues in Nunavik. Specifically, the NNHC will: provide Nunavik residents and health workers with background information to help them understand and contextualize contaminants research; communicate with the public about environmental health data, including results of Northern Contaminants research projects; help develop regional communications and evaluation strategies; prepare "easily accessible" and understandable state of the knowledge summaries to assist in communication and intervention activities of local health and environment officials; help researchers translate their data into meaningful information for the public; and support partnerships in various research and intervention activities related to country foods. The NNHC will continue to review and co-ordinate contaminants projects in Nunavik and conduct communication activities relating to these issues. The NNHC will continue to review all contaminant research proposals in the region for socio-cultural relevance and provide a review of all proposed communication activities. Members of the committee will continue to make themselves available to the public and will accompany researchers, when necessary, to introduce projects, present results, and participate in meetings and workshops relating to committee activities. The committee will take part in NCP management activities including assistance in the review process and attendance at Management Committee meetings.

**LOCATION(S) OF WORK:**

Kuujuaq, Nunavik

**SCHEDULE:**

For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leaders:** Minnie Grey  
Nunavik Nutrition and Health Committee  
Nunavik Regional Board of Health  
and Social Services  
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Chris Furgal

Public Health Research Unit

CHUL Research Centre

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G1E 7G9

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**TIME FRAME:**

April 2002 - March 2003.





## Temporal Trends of Persistent Organic Pollutants and Metals in Ringed Seals and Walrus from the Canadian Arctic

**Q** What are the changes over time in the levels of persistent organic pollutants and metals in seals across the Arctic?

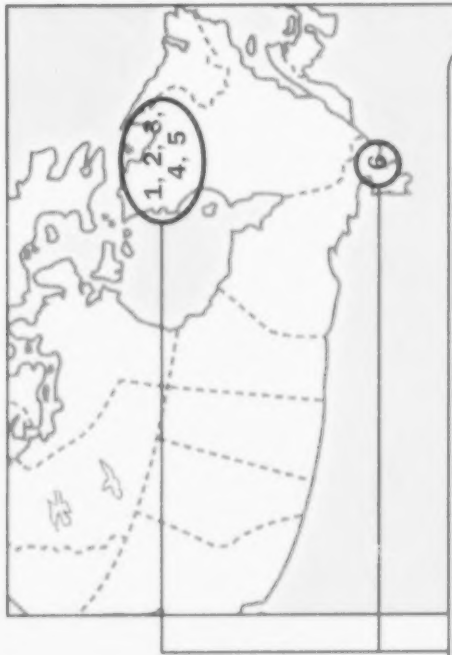
### RELEVANCE:

**Persistent organic pollutants (POPs)** and **heavy metals** have been detected in marine mammals from across the Arctic. However, there are significant geographical gaps in studies that examine contaminant trends in marine mammals over time. Previous work on POPs and metals in ringed seals from the 1970s to 1990s at locations in the high Arctic and Hudson Bay had not been followed up until this current study began. By continuing these studies and addressing information gaps there is an opportunity to determine whether **contaminant** levels are increasing or decreasing in the animals harvested and to involve Arctic communities in the scientific program.

### PROJECT SUMMARY:

The project will determine changes in concentrations of contaminants such as **PCBs** and **mercury** in the blubber and liver of ringed seals from locations previously studied in the 1980s and early 1990s. During 2001 the project collected samples with the help of the Hunters and Trappers Associations in Holman, Tuktoyaktuk, Paulatuk and Sachs Harbour and analysed samples from previous collections at Ikajutit (Arctic Bay), Ausuittuq (Grise Fiord), Pangnirtung and Qausuittuq (Resolute) collected in 1998-2000. Initial results for PCBs for female ringed seals at Ausuittuq and Ikajutit show significant declines in concentrations of PCBs and **DDT** in blubber from the 1970s to the 1990s with most of the change occurring in the 1970s and 1980s. Mercury concentrations appear to have increased in seals from Mittimatalik (Pond Inlet) from 1976 to 2000 but showed no change at Qausuittuq over the same time period.

In 2002/2003 the project will collect at least 25 seals from communities in Nunavik where samples were previously collected in the 1980s and 1990s. Samples collected in 2001 from the Western Arctic will also be analysed. All sampling is being done with the paid help of Hunters and Trappers Associations in each community. Hunters will be provided with a kit and video prepared in Inuktitut and English by the Nunavik Research Centre. Participation in previous years has been very good and all communities have provided a full set of samples each year. By March 2003 temporal trends of POPs and mercury will be available for 12 communities. This will provide a more comprehensive picture than presently available of temporal trends of contaminants in ringed seals over the past 20-30 years.



#### LOCATION(S) OF WORK:

1. Kangiqsujuag (Wakeham), Québec
2. Kangiqsuajjuag (George River), Québec
3. Quaqtaq, Québec
4. Inukjuag, Québec
5. Nunavik Research Centre, Makivik Corporation, Kuujuaq, Québec
6. National Water Research Institute, Environment Canada, Burlington, Ontario



#### SCHEDULE:

The project will continue throughout the current year with sample collection taking place primarily during the spring/summer hunt. To find out exactly when and where the project will be occurring, please contact the project leader directly.



#### CONTACT INFORMATION:

**Project Leader:** Derek Muir  
National Water Research Institute  
Environment Canada  
867 Lakeshore Road  
Burlington, Ontario  
L7R 4A6

Phone: (905) 319-6921  
Fax: (905) 336-6430  
E-mail: derek.muir@eciw.ca



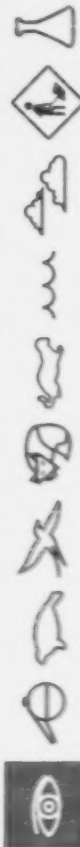
#### TIME FRAME:

April 2000 - March 2003. Information about the project will be provided to the Nunavik communities in late winter 2002. A presentation will be made at the Northern Contaminants Program (NCP) Symposium.

#### RELATED PROJECTS:

"Contaminants in Beluga and Ringed Seals from the Canadian Arctic" page 40; "Temporal Trends of Mercury in Beluga, Narwhal, and Walrus from the Eastern Arctic" page 62; "An early assessment of perfluorinated compounds in the Canadian Arctic" page 112; "Damage to the immune system of ringed seals in the circumpolar Arctic caused by persistent organic pollutants (POPs)" page 78; "Persistent Organic Pollutants (POPs) in Marine Mammals from the Canadian Arctic" page 80; "New Persistent Contaminants of Concern in an Eastern Arctic Marine Food Web" page 82; (H-01) "The Effects of Prenatal Exposure of Persistent Organic Pollutants (POPs) and Mercury on the Immune System of Inuit Infants" page 88; "Prenatal Exposure to PCBs and Mercury and Inuit Infant Development" page 90; "Methylmercury Risk Assessment for Arctic Populations" page 122; "Effects of Mixtures of Persistent Organic Pollutants (POPs) on the Immune System of Rats" page 124.





## A Preliminary Assessment of Perfluorinated Compounds in the Canadian Arctic

**Q** To what extent are "new" chemicals, such as perfluorinated compounds, found in water and animals in the Canadian Arctic, and where do they come from?

### RELEVANCE:

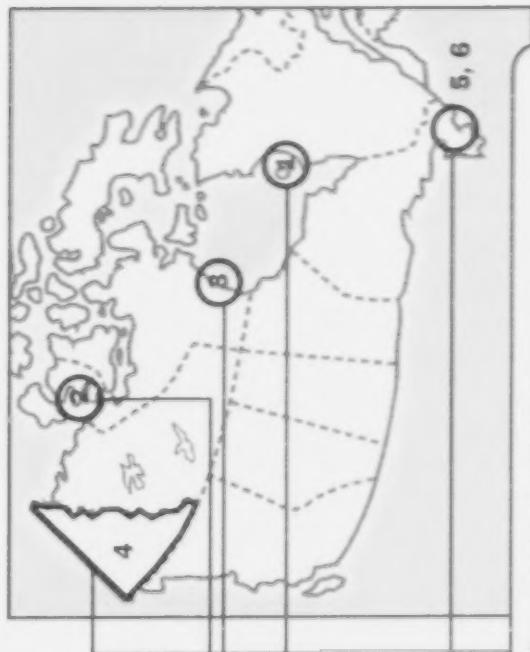
**Perfluorooctane sulfonate (PFOS)** and **perfluorooctanoic acid (PFOA)** are examples of perfluorinated acids (PFAs) that have recently been identified in liver and blood of polar bears and seals in the Arctic, including some samples from Nunavut. There is a lot of concern about the presence of these chemicals in the environment as PFAs are highly **persistent** and not known to degrade. They can cause cancer, lead to enlarged livers as well as affect the fertility of wildlife. Due to these concerns, the main manufacturer, 3M Co., is phasing out production, but levels may rise in the environment as widely used commercial and domestic products (e.g. Scotchgard® and Scotchban®) degrade. Other sources of PFAs include foams used to control fuel fires at airports and during military exercises on land and water. Mink, loons and other birds in the mid-latitudes have shown very high concentrations of PFAs in their livers. Human blood from industrialized countries has been shown to contain traces of some PFAs, which is of concern due to the relatively long time required for levels to decrease (e.g. 4 years for levels to drop to one-half). The implications for Arctic wildlife and peoples is not yet known but need investigation as PFAs may represent a new environmental threat.

### PROJECT SUMMARY:

This one-year project will analyse air at Kuujuaq in Nunavut, water from Kuujuaq and Holman, and selected Arctic biota samples from several areas in the Canadian Arctic to provide an early picture of levels and possible sources of PFAs. Some air and water samples will be collected by trained local people hired for the project. This information will also help assess the possible exposure of northerners to PFAs via traditional food. There are already concerns that levels of PFAs in some top predators may already exceed the levels known to cause effects. Seal livers will be analysed to better define the possible exposure to people as well as the potential risk to animals. Seabirds, Arctic fox and mink will also be analysed.

The project will use archived biological samples (except for zooplankton samples which will be new), including mink from Yukon, Arctic fox livers from Arviat and Holman, loons from Kuujuaq, and northern fulmar and black guillemot seabirds from Prince Leopold Island. Archived seal liver samples will be compared for Inukjuag, Holman and Grise Fiord. The results will be compared with other studies in southern Canada and the USA, including the Great Lakes regions, as a first step to assess the importance of these contaminants in the Canadian Arctic.





#### LOCATION(S) OF WORK:

1. Kuujuaq and Inukjuak, Nunavut
2. Holman, Northwest Territories
3. Arviat, Prince Leopold Island and Grise Fjord, Nunavut
4. Yukon
5. National Water Research Institute, Environment Canada, Burlington, Ontario
6. Department of Chemistry, University of Toronto, Toronto, Ontario

#### SCHEDULE:

Work on the archived samples will start immediately, while the air, seawater and zooplankton samples will be collected mid-year and analysed by the end of 2002. For more information, please contact the project leaders directly.



#### CONTACT INFORMATION:

**Project Leaders:** Derek Muir and Jon Martin  
National Water Research Institute  
Environment Canada  
867 Lakeshore Road  
Burlington, Ontario  
L7R 4A6

Phone: (905) 319-6921

Fax: (905) 336-6430

E-mail: derek.muir@ec.gc.ca

#### TIME FRAME:

April 2002 - March 2003. A progress report will be sent to each community or organization which has provided samples, as well as to the Northwest Territories and Nunavut Environmental Contaminants Committees. Results will also be presented at the Northern Contaminants Program (NCP) Symposium.

#### RELATED PROJECTS:

"New Persistent Contaminants of Concern in an Eastern Arctic Marine Food Web" page 82; "Revision and Expansion of Yukon Contaminant Fact Sheets" page 4.



# Other Locations





# Other Locations



## Effects of Mixtures of Persistent Organic Pollutants (POPs) on Reproduction and Health in Pigs and Rats

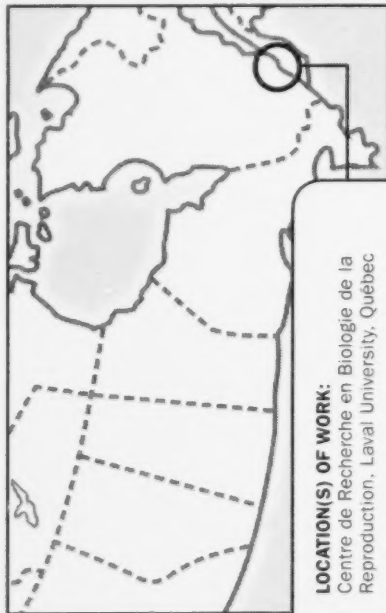
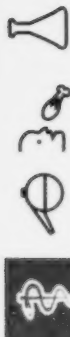
**Q** What are the effects of persistent organic pollutants (POPs) on human reproductive development and health?

### RELEVANCE:

**Traditional/country foods** of northern Aboriginal populations can contain a mixture of **contaminants**, such as **PCBs** and chlorinated **pesticides**, which are suspected of disrupting human endocrine (hormone) systems. Although the actual **toxicity** of these contaminants to human health is unclear, there is concern that exposure in humans may cause harm to the reproductive system, reducing fertility and possibly leading to various cancers. The fetus is particularly sensitive to the **endocrine-disrupting effects of persistent organic pollutants (POPs)**, since much reproductive development occurs in the womb during gestation. Since it is neither possible nor ethical to conduct experiments on humans to determine the actual effects of these contaminants, animal models are used in laboratory studies. In this study, it is proposed to use the porcine (pig) and rat models to determine the toxic effects of POPs on human reproductive development.

### PROJECT SUMMARY:

The overall goal of the project is to determine, from animal models, if chronic exposure to a mixture of POPs known to **bioaccumulate** in the Arctic **food chain** harms foetal development and reproductive health. Specifically, the project will use pigs to attempt to understand the toxic effects of POPs and their **metabolites** (which will be measured in the **serum** of animals exposed to POPs) on the maturation and function of **oocytes** and sperm and on the formation and development of embryos. The study will also determine the effects of exposure to environmentally relevant POPs mixtures, in the womb and through breast-feeding, on the reproductive development of male rat pups. The long-term objective of the project is to establish the toxicological response in the animal models to an environmentally relevant, defined mixture of PCBs and other contaminants on foetal development, and on the development of the reproductive and endocrine systems. The contaminant mixture to be used is designed to match the contaminant levels found in ringed seal blubber. This animal study will provide important information about whether human exposure to a mixture of contaminants found in the Arctic food chain is harmful to their reproductive, hormonal, and developmental health.



**LOCATION(S) OF WORK:**

Centre de Recherche en Biologie de la Reproduction, Laval University, Québec



**SCHEDULE:**

For more information on the project, please contact the project leader directly.



**CONTACT INFORMATION:**

**Project Leader:** Dr. Janice L. Bailey  
Centre de Recherche en Biologie de la Reproduction  
Département des sciences animales,  
Université Laval  
Pavillon Paul-Comtois, local 4147  
Ste-Foy, Québec  
G1K 7P4

Phone: (418) 656-2131 (ext. 3354)

Fax: (418) 656-3766

E-mail: janice.bailey@crbr.ulaval.ca

**TIME FRAME:**

April 2001 - March 2003. A final report will be prepared for March 2003. Preliminary results will be provided to the **Northern Contaminants Program (NCP)**.



**RELATED PROJECTS:**

"Health Effects in Rodents From Exposure to Environmental Contaminant Mixtures" page 120; "Effects of Mixtures of Persistent Organic Pollutants (POPs) on the Immune System of Rats" page 124.



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## Health Effects in Rodents From Exposure to Environmental Contaminant Mixtures

**Q** What are the effects of mixtures of environmental contaminants in food on the health of Arctic populations?

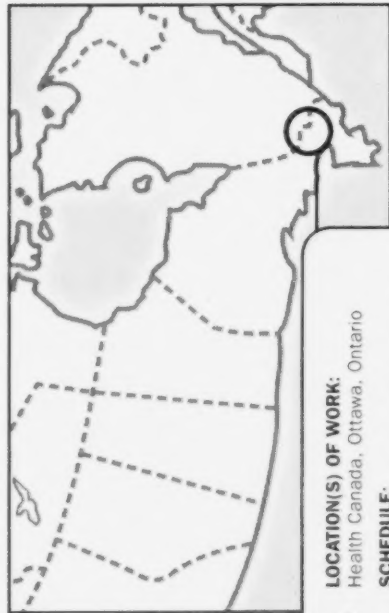
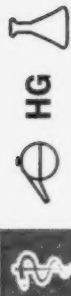
### RELEVANCE:

There is growing public and scientific concern that the health of Arctic peoples may be compromised by exposure to persistent environmental **contaminants**. The foetus and infants are especially sensitive to these contaminants, which have been associated with a wide range of **toxic** effects, including learning and developmental deficiencies. Although Arctic peoples are exposed to a wide variety of contaminants, most studies on adverse effects test single chemicals or simple mixtures. There is little current information on the effects of exposure to environmentally realistic mixtures of contaminants on Arctic peoples, in particular during prenatal and early life stages. This animal study will provide important information about whether human exposure to a mixture of contaminants found in the Arctic food chain is harmful to their reproductive, hormonal, and developmental health.

### PROJECT SUMMARY:

This project will investigate the neurological and related health effects of exposure to a mixture of persistent environmental contaminants during the sensitive neurodevelopmental stages of life, using an animal model. The contaminant mixture will be based on blood levels measured in people in the Arctic. This mixture will be fed to laboratory rats during pregnancy and lactation, and the offspring will be tested for a broad range of neurobehavioural measures including memory, learning capacity, and co-ordination. A wide range of clinical and **toxicological** observations relevant to human health will be made on the test animals at various life stages. The results from this study will provide public health officials with a better understanding of the potential detrimental effects of exposure to mixtures of persistent environmental contaminants relevant to Arctic peoples.



**LOCATION(S) OF WORK:**

Health Canada, Ottawa, Ontario

**SCHEDULE:**

For more information on the project, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Dr. Ih Chu  
Environmental and Toxicology Division  
Healthy Environments and Consumer  
Safety Branch  
Health Canada  
Ottawa, Ontario  
K1A 0L2

Phone: (613) 997-1837

Fax: (613) 941-4768

E-mail: [Ih\\_Chu@hc-sc.gc.ca](mailto:Ih_Chu@hc-sc.gc.ca)**TIME FRAME:**

April 2001 - March 2003. Early developmental measures and early behavioural test data were collected in the first year of study. The remainder of the behavioural data should be available by June 2002. Additional information will be prepared and delivered in Fall 2002 and Spring 2003. Preliminary results will be presented to the **Northern Contaminants Program (NCP)**. Completed studies will be published in peer-reviewed journals.

**RELATED PROJECTS:**

- "Effects of Mixtures of Persistent Organic Pollutants (POPs) on Reproduction and Health in Pigs and Rats" page 118;
- "Effects of Mixtures of Persistent Organic Pollutants (POPs) on the Immune System of Rats" page 124.



## Methylmercury Risk Assessment for Arctic Populations

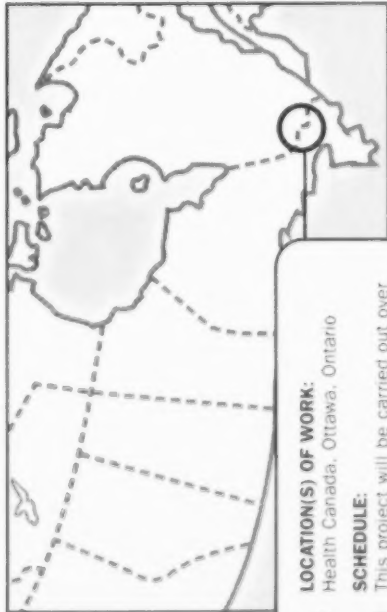
**Q** Could mercury exposure from traditional/country foods cause adverse health effects?

### RELEVANCE:

**Mercury**, particularly the organic form of the metal, **methylmercury**, is a primary **contaminant** of concern to public health in the Canadian Arctic. It is well known that continuous exposure to elevated levels of methylmercury can be harmful to the central nervous system. For this reason various health organizations including Health Canada have developed guidelines for exposure to methylmercury in order to protect human health. **Traditional/country foods** with high levels of methylmercury, such as fish and marine mammals, are the primary pathway of exposure to Northerners. Little is known about how levels of methylmercury in traditional/country foods relate to levels in humans. Predicting human exposure through the consumption of traditional/country foods is very important for evaluating potential mercury related health risks and developing realistic **food consumption advisories**.

### PROJECT SUMMARY:

This project will make use of a computer model to predict human exposures to methylmercury from traditional/country foods. The model will estimate overall methylmercury exposure levels in hair and blood. The model will not only account for intake through diet but will also account for excretion and metabolism. Existing contaminants and dietary survey data generated through the **Northern Contaminants Program (NCP)** will be used to calculate dietary intake of contaminants. Data for existing contaminant levels in Northern people will also be used by the model for determining overall methylmercury exposure. Overall exposure will be calculated for a variety of scenarios and dietary parameters so that the researchers can determine which factors have the greatest influence on exposure. Exposures will be compared to guidelines as published by Health Canada, the World Health Organization and the United States Environmental Protection Agency. The results of this work will enable health authorities to provide more accurate information to Northerners on the benefits and risks of consuming traditional/country food.

**LOCATION(S) OF WORK:**

Health Canada, Ottawa, Ontario

**SCHEDULE:**

This project will be carried out over a one year period.

For more information on the project, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Mark Feeley  
 Bureau of Chemical Safety  
 Health Products and Food Branch, Health Canada  
 2204D1 Banting Research Centre,  
 Tunney's Pasture  
 Ottawa, Ontario  
 K1A 0L2

Phone: (613) 957-1314

Fax: (613) 957-1688

E-mail: mark\_feeley@hc-sc.gc.ca

**TIME FRAME:**

April 2002 - April 2003. Summary reports will be produced for the use of regional health authorities and advice will be provided on incorporating findings into community consultation. The results of this work will be presented to the Northern Contaminants Program (NCP). Completed studies will be published in peer-reviewed journals.

**RELATED PROJECTS:**

"Effects of Prenatal Exposure to OCs and Mercury on the Immune System of Inuit Infants" page 88; (H-3) "Follow-up of Preschool Aged Children Exposed to PCBs and Mercury Through fish and Marine Mammal Consumption" page 92; "Evaluation of a Risk Management Strategy to Protect Pregnant Women from contaminant Exposure in Nunavik" page 98; "Completing CINE Data and Reports from Three Major Dietary Studies" page 126.



## Effects of Mixtures of Persistent Organic Pollutants (POPs) on the Immune System in Rats

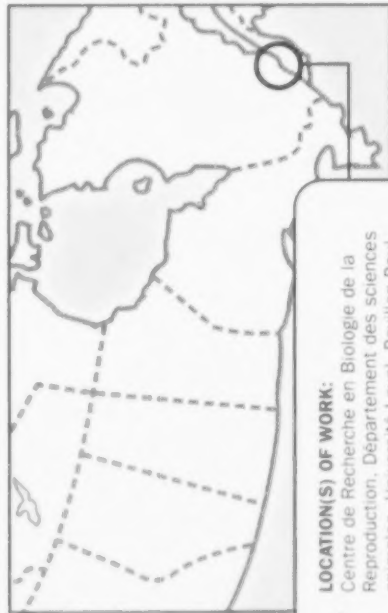
**Q** What are the effects of persistent organic pollutants (POPs) on human immune function?

### RELEVANCE:

**Traditional/country foods** of Northern Aboriginal populations contain a mixture of **contaminants**, such as **PCBs** and chlorinated **pesticides**, which are suspected of disrupting human **immune function**. Although the actual **toxicity** of these contaminants to human immune system is unclear, there is concern that exposure may reduce the body's resistance to disease. The foetus and infants are particularly sensitive to the effects of **persistent organic pollutants (POPs)**, since much immune system development occurs in the womb during pregnancy and during early maturation following birth. This period of growth is also the time when children are most susceptible to contaminant exposure from the mother during pregnancy and through breast milk as an infant. Since it is neither possible nor ethical to conduct experiments on humans to determine the actual effects of these contaminants, animal models are used in laboratory studies. In this study, the rat model is used to determine the toxic effects of POPs on immune system development.

### PROJECT SUMMARY:

The overall goal of the project is to determine, from animal models, if prenatal and infant exposure to a mixture of POPs known to **bioaccumulate** in the Arctic **food chain** could potentially harm foetal development and immune function. In order to assess effects on the developing immune system, scientists will examine various aspects of immune function in young male rats that were exposed to a complex mixture of contaminants while developing in the womb and as pups through breast-feeding. The contaminant mixture to be used is designed to match the contaminant levels found in the fat of ringed seals. This study is being added to an ongoing study that was initiated in 2001 and examined the effects of contaminant exposure on the reproductive systems of rats. Both of these studies are being carried out in a controlled laboratory setting. The results of this study will provide valuable information about the effects contaminants might have on the developing immune systems of rats. This information will also help develop an understanding of the potential risks to children and their ability to resist illness as a result of contaminant exposure.



**LOCATION(S) OF WORK:**

Centre de Recherche en Biologie de la Reproduction, Département des sciences animales, Université Laval, Pavillon Paul-Contois, local 4147, Site-Foy, Québec



**SCHEDULE:**

For more information on the project, please contact the project leader directly.



**CONTACT INFORMATION:**

**Project Leader:** Pierre Ayotte  
Public Health Research Unit  
Laval University Medical Research Centre  
Centre Hospitalier Universitaire de Québec (CHUQ)  
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G1E 7G9

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Fax: (418) 666-2776

E-mail: pierre.ayotte@crchul.ulaval.ca



**TIME FRAME:**

April 2002 - March 2003. Preliminary results will be presented to the **Northern Contaminants Program (NCP)**. A final report will be prepared for March 2003 and scientific papers will be prepared for publication in peer reviewed journals.

**RELATED PROJECTS:**

- Effects of Mixtures of Persistent Organic Pollutants (POPs) on Reproduction and Health in Pigs and Rats" page 118;
- Health Effects in Rodents From Exposure to Environmental Contaminant Mixtures" page 120.

## Completing CINE Data and Reports for Three Major Dietary Studies

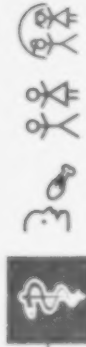
**Q** What are the nutritional and cultural benefits of a diet of traditional/country food?

### RELEVANCE:

Benefit and risk assessments of traditional/country food should include nutrient information on food items that are commonly consumed by Northerners. While most market foods have nutrient information available, the same can not be said for traditional/country foods. This is particularly true for nutrients, such as vitamins and fatty acids, that are not stable under normal storage conditions. Analysis of dietary data from Dene/Metis, Yukon and Inuit communities have consistently shown that traditional/country food provides a rich source of many nutrients, and that this food has greater nutrient value than the market food regularly available and generally selected in communities. Dietary evaluations conducted by the Centre for Indigenous Peoples' Nutrition and Environment (CINE) have identified the traditional/country foods most frequently consumed. Samples of these foods have now been collected from throughout Canada's North and analysed for key nutrients. This data now needs to be compiled in a way that is useful to both Northerners and scientists alike.

### PROJECT SUMMARY:

The long-term goal is to ensure that the extensive work conducted by food sampling and interviewing Canadian Arctic Aboriginal peoples concerning their traditional and market food use is up-to-date and reported without further delay. The compilation of this information will incorporate a comprehensive review of existing data as well as new and previously unused data. Using the updated information, CINE will be able to improve their analysis, strengthen their original findings and develop more meaningful conclusions. A priority of this project is that updated reporting be completed in a timely manner so that information can be made available to Northerners and internationally, thus making it available to other Indigenous peoples and Arctic scientists.





**LOCATION(S) OF WORK:**

Centre for Indigenous Peoples' Nutrition and Environment (CINE),  
Montreal, Québec



**SCHEDULE:**

For more information on the project, please contact the project leader directly.



**CONTACT INFORMATION:**

**Project Leader:** Harriet V. Kuhnlein  
Centre for Indigenous Peoples' Nutrition and Environment (CINE)  
Macdonald Campus of McGill University  
21-111 Lakeshore Road  
Ste. Anne de Bellevue, Québec  
H9X 3V9

Phone: (514) 398-7757

Fax: (514) 398-1020

Email: harriet.kuhnlein@mcgill.ca



**TIME FRAME:**

April 2002 - March 2003. This project will produce a series of data reports and peer reviewed publications. Plain language summaries of all new and revised findings will be presented to the **Northern Contaminants Program (NCP)** and its Aboriginal partners (Council of Yukon First Nations, Dene Nation, Inuit Tapiriit Kanatami).

**RELATED PROJECTS:**

-Determinants of Food Choices in Labrador" page 94.





31.16

## Communication Strategy for Canadian Arctic Contaminants Assessment Report II (CACAR II)

**Q** How will the information contained in CACAR II be communicated to Northerners, Southerners, and an International audience?

### RELEVANCE:

The Canadian Arctic Contaminants Assessment Report II (CACAR II) is a compilation and synthesis of all research conducted under the Northern Contaminants Program (NCP) for the last 5 years (1997-2002). Much of the information in this report is of a sensitive nature to Northern Aboriginal peoples because of the subject matter – **contaminants** – which are seen as a threat to the health and well-being of individuals and communities who rely strongly upon traditional/country food.

### PROJECT SUMMARY:

The main objective of this project is to communicate key results and findings of the Canadian Arctic Contaminants Assessment Report II (CACAR II) to three audiences: northern peoples for whom the information is particularly urgent due to its implications for decision-making regarding traditional/country food; other northern peoples, particularly those who have taken part in NCP activities during Phase II and are anticipating results; and southern and international audiences for whom the information is critical for continued action on contaminants in the Arctic. Communication with these audiences will be undertaken in many ways, and will be linked with other communications projects already taking place. Sets of "key messages" from CACAR II will be developed and delivered through various media, including radio phone-in shows, newspaper inserts, presentations to schools, updated websites, and participation in workshops.



**CONTACT INFORMATION:**

**Project Leaders:** Simon Smith/Jason Stow  
Northern Science and Contaminants Directorate  
Indian and Northern Affairs Canada (INAC)  
10 Wellington Street  
Gatineau, Québec  
K1A 0H4

Phone: (819) 997-9448/-0879  
Fax: (819) 953-9066  
E-mail: smithsm@inac.gc.ca  
stowj@inac.gc.ca

**TIME FRAME:**

April 2002 - March 2003

**RELATED PROJECTS:**

"Communication of Northern Contaminants Program (NCP)  
Results in the Northwest Territories using Various Media"  
page 34.

**LOCATION(S) OF WORK:**

Throughout Canada

**SCHEDULE:**

For more information on  
the project, please contact  
the project leaders directly.





## Co-ordination and Administration of the Northern Contaminants Program (NCP)

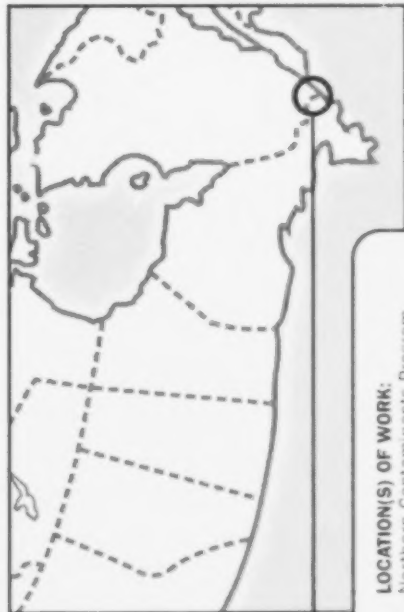
**Q** How is the Northern Contaminants Program administered?

### RELEVANCE:

Since 1991/1992, Indian and Northern Affairs Canada (INAC) has provided the **Northern Contaminants Program (NCP)** with financial administration and management services to support more than 400 scientific and other northern-related projects. These administration and management services enable the central co-ordination of the program among four federal departments, departments from three territorial governments, four Aboriginal organizations, and approximately 12 universities and research institutes. INAC maintains the chair and secretarial support of the NCP Management Committee, and the secretarial support of the four NCP Review Teams (Human Health, Monitoring, Education/ Communication, and Social/Cultural). This management structure ensures that the program remains scientifically defensible, while at the same time, achieves real progress in terms of its broad policy objectives.

### PROJECT SUMMARY:

INAC headquarters will continue to offer financial and secretariat support to, and overall co-ordination of, the NCP. This will include at least two Management Committee meetings and various ad hoc meetings and workshops. INAC will also co-ordinate and implement various communications activities with the Aboriginal organizations and the territorial contaminants committees. Some highlights of activities this year include: the publication of the Canadian Arctic Contaminants Assessment Report II to be publicly released in winter 2002/2003; maintenance and up-dating of the NCP website; development of a database of current and past NCP projects, and Summary of NCP Projects booklet. In addition, INAC will organize the NCP Symposium on Canadian Arctic Contaminants Assessment to take place in March 2003.

**LOCATION(S) OF WORK:**

Northern Contaminants Program  
Headquarters, Gatineau, Québec

**SCHEDULE:**

For more information, please contact  
the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** David Stone

Director  
Northern Science and Contaminants Research  
Indian and Northern Affairs Canada (INAC)  
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Gatineau, Québec  
K1A 0H4

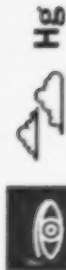
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**TIME FRAME:**

Ongoing to March 2003.



## Mercury Measurements at Amderma, Russia

**Q** How much mercury is being transported through the atmosphere and deposited in the Arctic?

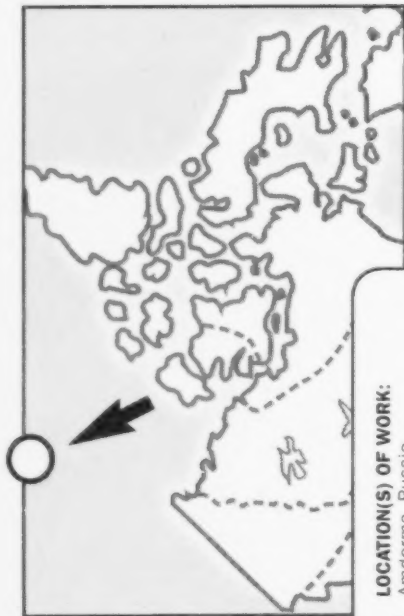
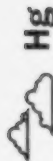
### RELEVANCE:

**Mercury** in the environment can come from both natural and human-made (**anthropogenic**) sources. In the atmosphere it is found in the **vapour** phase or attached to small particles. Mercury can travel through the atmosphere to the Arctic to be deposited along with precipitation (snowfall and rain) or simply fall out of the air attached to airborne particles. Once in the environment, mercury can potentially get into the Arctic **food chain**.

There is recent evidence that concentrations of mercury in the Arctic environment are increasing. Mercury vapour has been measured at four different Arctic sites on a routine basis: Alert (Nunavut), Kuujuaupik (Nunavik), Point Barrow (Alaska, United States) and Svalbard/Spitsbergen (Norway). The site in the western Russian Arctic at Amderma will help fill the gap of information on the distribution of mercury in the Arctic environment, and will provide data for the development of long-term international strategies to control and monitor the release of mercury into the environment. These additional measurements will also add to the understanding of the transport, transformation and deposition processes of mercury that lead to the appearance of this **heavy metal** in the food chain.

### PROJECT SUMMARY:

In collaboration with Russian scientists, this project will determine trends in the concentration of mercury in the atmosphere, as well as the deposition processes of mercury in the Arctic at Amderma, Russia, by measuring mercury vapour in the air. Air measurements at Amderma are being taken in order to obtain baseline data and information on trends and to determine the extent of mercury concentrations in the Russian Arctic region, and the Arctic region as a whole. This project will also look at the seasonal and annual variations of mercury concentrations in air and, together with other researchers in the circumpolar region, study the circumpolar behaviour of mercury by comparing data from different Arctic stations. The mercury data from Russia will add to the understanding of the behaviour of mercury in the Arctic and help determine whether mercury levels are increasing or decreasing.



**LOCATION(S) OF WORK:**

Amderma, Russia

**SCHEDULE:**

The project will continue through the current year. For more information, please contact the project leader directly.



**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2000 - March 2003. Research papers and reports will be written to provide up-to-date results from the project to the public. Results will also be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report. The results from the research are also reported to the Russian governmental organization Roshydromet and to the Arctic Monitoring and Assessment Programme (AMAP).

**RELATED PROJECTS:**

"Northern Contaminants Air Monitoring: Persistent Organic Pollutant Measurements" page 72; "Atmospheric Mercury Measurements at Alert" page 74; "An early assessment of perfluorinated compounds in the Canadian Arctic" page 112; "A Comprehensive Theoretical Study of Organic Contaminants as Influenced by Falling Snow and Seasonal Snow Cover" page 136; "Scientific Evidence to Support International and Regional Control Initiatives for Persistent Organic Pollutants (POPs) and Mercury" page 138; "Facilitation of International Action related to the Long-Range Transport of Contaminants into the Arctic" page 144.



## Global Inventory of Pesticide Emissions

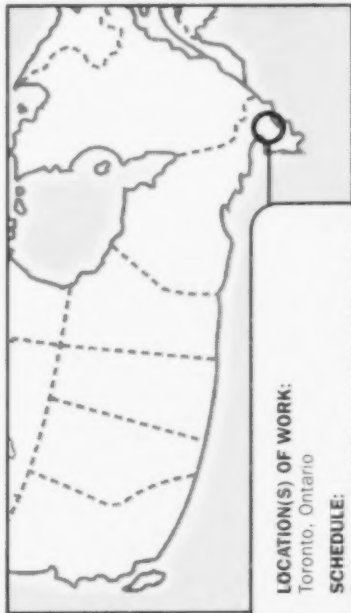
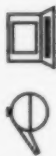
**Q** Is there a relationship between global usage of various pesticides and their levels in the Canadian Arctic?

### RELEVANCE:

POPs such as **hexachlorocyclohexanes (HCHs)**, **DDT**, **toxaphene**, **lindane** and **endosulfan**, are abundant in the Arctic environment, and have been detected in Arctic air, snow, seawater, and polar bears and marine mammals. The sources of these persistent and **toxic** chemicals and the pathways they take to reach the Arctic are known for some POPs, but not for others. Although DDT and toxaphene are included by the United Nations Environment Programme (UNEP) POPs Convention for international action, they continue to be used in many developing countries for the control of insects and in agriculture. Even where the chemicals were banned many years ago, emissions are still produced from the residues. **Lindane** and **endosulfan** are still in use in North America. A global emissions inventory will identify where emissions are coming from, and help understand the link between their usage and concentrations in the Arctic.

### PROJECT SUMMARY:

This project will study the global usage and emission trends for selected **organochlorine pesticides** detected in the Arctic. It will gather information about the usage and contamination around the world of these pesticides and produce inventories of HCH, DDT, toxaphene, lindane, and endosulfan emissions around the globe. The data will contribute to a better understanding of the relationship between global trends in pesticide use and the concentrations of these chemicals in the Arctic. The data can be used in atmospheric models to better understand the relationships between emission and deposition, and will also contribute to international work to control emissions on a hemispheric or global basis.

**LOCATION(S) OF WORK:**

Toronto, Ontario

**SCHEDULE:**

Project work will be conducted throughout the year. For more information, please contact the project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Yi-Fan Li  
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 Toronto, Ontario  
 M3H 5T4

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**TIME FRAME:**

April 2001 - March 2003. Final inventories for DDT are expected to be completed in fall 2002, while inventories for the other chemicals will be completed by the end of March 2003. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium and written up in the annual Synopsis of Research Report, as well as presented at the Global Emission Inventories Activities (GEIA) workshop.

**RELATED PROJECTS:**

"Facilitation of International Action related to the Long-Range Transport of Contaminants into the Arctic" page 144.



## A Comprehensive Theoretical Study of Organic Contaminants as Influenced by Falling Snow and Seasonal Snow Cover

**Q** What contaminants are most likely to be deposited by falling snow, and how does the seasonal snow pack influence the fate of these chemicals?

### RELEVANCE:

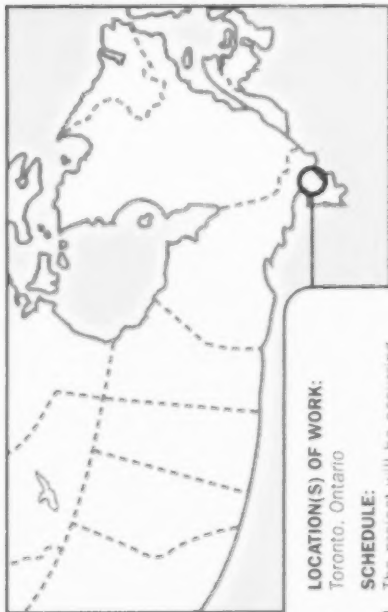
**Contaminants** are transported to the Arctic in a variety of ways including through the atmosphere and via the ocean. Those that are transported through the atmosphere can be deposited directly onto the surface, or they can be carried there in rain or snow. The theoretical understanding of how contaminants are picked up and deposited by snow is limited. It is also not well understood how contaminants reach the biotic environment once they have been deposited on the surface of a seasonal snow pack. The work proposed here will improve the computer models used to predict the transport of contaminants to the surface by falling snow, and the behaviour of these contaminants after they have been deposited in the environment.

### PROJECT SUMMARY:

This theoretical computer modelling project will investigate how snow influences the behaviour of organic contaminants in the Arctic environment. Two comprehensive modelling studies will be undertaken. The first will analyse the known physical and chemical properties of a large number of contaminants to identify which are most likely to be picked up and carried to the ground by falling snow. The mechanisms that cause this deposition to occur will also be identified. The model will then be used to predict the amount of contaminants expected to be deposited by snow at different temperatures. These predictions will be compared to actual amounts measured during earlier field work.

The second modelling study will look at whether and how the seasonal snow pack affects the transport of contaminants from the snow pack into the ecosystem (especially into the surrounding air and water bodies). This will require building into an existing computer model a component that deals with the seasonal snow pack.




**LOCATION(S) OF WORK:**

Toronto, Ontario

**SCHEDULE:**

The project will be occurring throughout the year. For more information, please contact the project leader directly


**CONTACT INFORMATION:**

**Project Leader:** Frank Wania  
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M5R 1P1

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E-mail: frank.wania@utoronto.ca


**TIME FRAME:**

April 2002 - March 2003. The two comprehensive modelling investigations will be completed within one year. Informal information exchange will take place from time to time with Environment Canada scientists interested in this project. Two peer-reviewed journal publications are anticipated. Results will be presented at the **Northern Contaminants Program (NCP)** Symposium, and written up in the annual Synopsis of Research Report.

**RELATED PROJECTS:**

"Atmospheric Mercury Measurements at Alert" page 74;

"Mercury Measurements at Amderma, Russia" page 132.



## Scientific Evidence to Support International and Regional Control Initiatives for Persistent Organic Pollutants (POPs) and Mercury

**Q** How important is scientific justification for contaminant control initiatives?

### RELEVANCE:

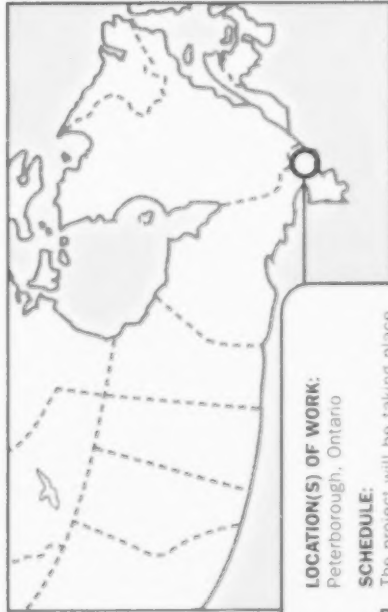
Significant progress has been made in recent years to achieve international agreements to control **persistent organic pollutants (POPs)** and other substances which can be transported long distances. In May 2001, Canada ratified the Stockholm Convention on POPs, which controls the use of twelve substances. However, such agreements still need to be implemented and extended to cover other substances which may affect Arctic ecosystems and peoples. Solid scientific evidence of the characteristics, effects and transport of these other substances can help put in place international measures to curb their use. New POPs also need to be identified and assessed since the 12 now controlled likely represent only the first of a larger group of contaminants. Such information is used by Canadian representatives at international meetings such as the United Nations Environment Programme (UNEP) to demonstrate that certain POPs and heavy metals, particularly mercury, are deposited in the Arctic as a result of their use in temperate and tropical regions.

### PROJECT SUMMARY:

This project will work to establish sound scientific reasons to curb the use of new POPs, by using computer models to predict the extent to which these chemicals persist and migrate to the Arctic. Mass balance models are being developed to demonstrate the fate of contaminants used in temperature and tropical regions. The models to be used will predict how much of a particular chemical or POP used in the south will be transported to the North, how long this transport will take, and how long the resulting toxic burden is likely to last in the North.

The global model will be tested using **hexachlorocyclohexane (HCH)**, **PCBs**, **DDT**, **atrazine**, and **toxaphene**. Comparisons will be made with the results from models developed at the Max Planck Institute in Hamburg, Germany. The chemical properties of these substances will also be analysed to identify which are the most likely to be transported to the North. Work will continue to effectively integrate **mercury** into this model.

A second model to predict the long-range transport of a number of contaminants will be evaluated. The model addresses the phenomenon known as the grasshopper effect, whereby contaminants released into the atmosphere in warm regions go through several cycles of evaporation, travel in air currents, and deposition in cooler regions, eventually to reach the Arctic.


**LOCATION(S) OF WORK:**

Peterborough, Ontario

**SCHEDULE:**

The project will be taking place throughout the year. For further information, please contact the project leader directly.


**CONTACT INFORMATION:**
**Project Leader:** Don Mackay

DMER

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K9L 1N6

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**TIME FRAME:**

April 2002 - March 2003. Progress reports will be produced and draft reports will be provided to the Indian and Northern Affairs Canada (INAC) in advance of publication. Issues relating to POPs in the north will continue to be published in the scientific literature, in the popular media, and as reports of the Canadian Environmenta, Modelling Centre (CEMC) at Trent University.

**RELATED PROJECTS:**

"Northern Contaminants Air Monitoring: Persistent Organic Pollutant Measurements" page 72.

## Northern Contaminants Interlaboratory Quality Assurance Program

**Q** How can we make sure that all Northern Contaminants Program laboratory data are accurate, reliable, and comparable?

### RELEVANCE:

**Quality Assurance/Quality Control (QA/QC)** are essential elements of all research and monitoring programs. Laboratory comparison studies provide assurance on the quality and reliability of data being generated and on the comparability of measurement results between laboratories. Without this assurance of data quality and comparability, the value of measurement information will be lost. It is important that **Northern Contaminants Program (NCP)** managers and Northerners have a scientifically sound basis upon which to make their decisions regarding the sources of **contaminants** and their effects on the Arctic environment and on human health. This information will ensure that the NCP's contribution to international agreements and controls to protect the health of the Arctic ecosystem and Northerners is based on scientifically sound data.

### PROJECT SUMMARY:

This project will ensure that NCP data are produced to acceptable levels of precision and accuracy, and that the data can be compared among the different laboratories and between research projects. The priorities for the NCP QA program continue to be trace metals, **organochlorines (OCs)**, **PCB congeners**, and **toxaphene**. Progress to date has shown good comparability between laboratories for key **heavy metals** such as **arsenic**, **cadmium**, **copper**, **mercury**, and **zinc**, while **toxaphene** comparisons can vary significantly among laboratories. This year's work will include interlaboratory comparisons of 1) **toxaphene**, and 2) heavy metals, including mercury, **methylmercury**, **arsenic**, **cadmium**, **selenium**, and **lead** in seabird tissue, polar bear liver, walleye or pike, and possibly sediment samples.

**LOCATION(S) OF WORK:**

National Water Research  
Institute, Burlington, Ontario

**SCHEDULE:**

The project will be occurring  
throughout the year. For more  
information, please contact the  
project leader directly.

**CONTACT INFORMATION:**

**Project Leader:** Yvonne Stokker  
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Email: [yvonne.stokker@ec.gc.ca](mailto:yvonne.stokker@ec.gc.ca)

**TIME FRAME:**

April 2002 - March 2003. Project results will be  
presented at the **Northern Contaminants Program**  
(NCP) Symposium in 2003.



## International Activities and the Ongoing Work of the Inuit Circumpolar Conference (ICC) – Mercury and POPs: 2002-2003

**Q** What can Aboriginal organizations do to ensure international action on the effective reduction of Persistent Organic Pollutants (POPs) and heavy metals?

### RELEVANCE:

The persistence and **lipophilic** nature of **Persistent Organic Pollutants (POPs)** entering the Arctic result in their **bioaccumulation** in fat-rich tissues of Arctic animals. These contaminants reach highest levels in long-lived mammals at the top of the **food chain** (e.g. seals, whales, polar bears). Because of their dependence on traditional/country foods, there is a significant and immediate public health issue for Inuit. The Inuit Circumpolar Conference of Canada (ICC Canada) has the mandate to represent Inuit in Canada on issues of international significance. An important focus of the Environmental and Research Department has been on international chemical management activities, particularly to reduce global emissions of Persistent Organic Pollutants (POPs). During the last 5 years ICC Canada has been an active participant in the **Arctic Monitoring and Assessment Programme (AMAP)** of the Arctic Council, and the key co-ordinating member of Canadian Arctic Indigenous Peoples Against POPs (CAIPAP). It has also been an observer throughout negotiation of the Persistent Organic Pollutants (POPs) and Heavy Metals protocols under the United Nations Economic Commission for Europe's (UNECE) Long Range Transport of Atmospheric Pollutants (LRTAP) Convention and the Stockholm Convention on POPs.

### PROJECT SUMMARY:

ICC Canada has participated in a number of activities to ensure that Northern Aboriginal peoples' concerns over contaminant issues are brought to the attention of the global community. This project will ensure the continued participation and intervention by ICC on the international level. This year's activities include participation in two meetings: The Sixth Session of the Intergovernmental Negotiating Committee (INC 6) for an International Legally Binding Instrument for Implementing International Action on Certain Persistent Organic Pollutants, in Geneva, Switzerland June 17-22, 2002 (as part of the Canadian Delegation); and, the meeting of the UNEP Working Group on Global Mercury, that took place September 9-13, 2002 in Geneva to review the information gathered during the first phase of the assessment. ICC Canada will report to the NCP, partners, clients and Inuit communities as to the results, accomplishments and challenges raised in these meetings. It will submit to the Canadian government Inuit perspectives on issues addressed at INC-6, and will prepare a special issue of its policy journal *Silarjulariniq*, on international chemical management initiatives.



**LOCATION(S) OF WORK:**

1. Ottawa
2. Iqaluit

**SCHEDULE:**

For more information, please contact the project leader directly.



**CONTACT INFORMATION:**

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**TIME FRAME:**

April 2002 - March 2003.



## Facilitation of International Action related to the Long-Range Transport of Contaminants into the Arctic

**Q** What international actions is Canada taking to control the transport of contaminants through air and water to the Arctic from outside sources?

### RELEVANCE:

International action is required to stop the transport of **contaminants** to the Canadian Arctic and to reduce the accumulation of contaminants in northern **food chains**. This can only be achieved by identifying where the contaminants are coming from and by reducing or eliminating their use at these sources through international agreements that would limit the production and use of these contaminants.

### PROJECT SUMMARY:

The Northern Contaminants Program (NCP) has demonstrated the significance of long-range transboundary air pollution to the Arctic. The activities covered under this project are intended to: 1) facilitate international co-operation to identify the significance of long-range contaminant sources and their transport pathways; and 2) assist implementation and development of appropriate international controls on emissions and discharges. Reduction and elimination of contaminant input to the Arctic from distant sources outside of Canada requires comprehensive international co-operation which includes the following:

1. Facilitating implementation of the 1998 Aarhus POPs and Heavy Metals Protocols under the Convention on Long-range Transboundary Air Pollution (LRTAP). A final report for the World Health Organization-LRTAP was prepared for review and approved at a meeting in Geneva in May 2002, with another report being prepared for the "Experts Group on POPs" (EGPOPs), held in Geneva in June 2002.

2. Facilitating implementation of the 2001 Stockholm Convention on POPs and associated global actions on POPs. UNEP will be holding a number of meetings this year to consult on how the global monitoring may be organized. This year's funds will ensure representation of NCP interests in these consultations and will assist the development of appropriate monitoring capacity in developing countries. Reports will continue to be published by UNEP.
3. Facilitation of the inclusion of Canadian Arctic issues in the global assessment of mercury being undertaken by UNEP. This year's funding will support NCP input to the UNEP draft report. Reports on progress and the final assessment will be published by UNEP, and UNEP Governing Council will consider the report in early 2003.
4. Participation in the Arctic Monitoring and Assessment Programme (AMAP). This year will see a continuation on implementing the Canadian contribution to the second phase of AMAP.
5. Participation in the Arctic Council Action Plan (ACAP). Two ACAP projects are now in progress: one on mercury emissions and the other on the disposal of obsolete pesticides. No NCP funds are being used for these projects.





**LOCATION(S) OF WORK:**  
National Capital Region,  
Gatineau, Québec



**CONTACT INFORMATION:**

**Project Leader:** David Stone  
Director

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**TIME FRAME:**

April 2002 - March 2003



# Appendices

Appendices





# Appendices





# Glossary

## AMAP

The Arctic Monitoring and Assessment Programme (AMAP) is an international organization established in 1991 to implement components of the Arctic Environmental Protection Strategy (AEPS). Now a programme group of the Arctic Council, AMAP's current objective is "providing reliable and sufficient information on the status of, and threats to, the Arctic environment, and providing scientific advice on actions to be taken in order to support Arctic governments in their efforts to take remedial and preventive actions relating to contaminants".

## ABIOTIC

An abiotic environment refers to the non-living natural environment made up of non-living, inorganic, objects such as rocks and minerals.

## ANTHROPOGENIC

Originating from human activity.

## ARCHIVED

Archived samples are samples (e.g. animal tissues or organs) that are stored, usually in freezers, for future analysis.

## ARSENIC

Arsenic is a steel grey, brittle metallic element that is found naturally in rocks and soil. Some of its compound are poisonous and are used as agricultural **insecticides** and poisons. Arsenic can **bioaccumulate** in plants and animals.

## BENTHIC

The benthic layer is the sediment and mud found at the bottom of lakes, rivers and oceans. Benthic organisms live on the bottom or in these sediments. Pelagic organisms live in the water column.

## BIOACCUMULATION

Bioaccumulation is the build-up or storage of substances (such as contaminants) in the bodies of animals over time. Bioaccumulation of **contaminants** can occur by eating animals or drinking water that contain these contaminants. Contaminants that bioaccumulate are very slow to change or do not change to a chemical form that can be digested and eliminated by the animal.

### Bioaccumulation



## BIOAVAILABILITY

A chemical is bioavailable when it is in a form that can be taken up or absorbed by plants and animals.

## BIOMAGNIFICATION

When an animal eats a plant or another animal, it consumes all the contaminants stored in that food. Contaminants can biomagnify in animals that use other animals for food because the concentration increases with each step from prey to predator.

### Biomagnification



**BIOMARKER**

A biomarker is a certain biological element that undergoes change when exposed to a stressor, such as chemical contamination. Biological chemicals such as enzymes are common biomarkers used to detect exposure to contamination as well as subtle (non-serious) biological effects caused by contamination.

**BIOMONITORING**

Biomonitoring is a method of testing and monitoring different contaminants in the environment through living organisms. For example, polar bear tissue may be analysed as a way of biomonitoring **POPs** in the Arctic marine environment.

**BIOTA**

The animal and plant life (i.e. living things) of a region.

**BIOTIC**

A biotic environment refers to living organisms in the environment.

**BROMINE**

Bromine is a naturally occurring element. It is a dense, deep reddish brown liquid that is easily vaporized into a brownish-red **vapour**. It occurs mainly as the bromide ion,  $\text{Br}^-$ , in salts in seawater and in many saline springs. Metal bromides occur in small amounts in seawater and salt deposits as well as in water from mineral springs. One of the most common uses of bromine is for the manufacture of bromine compounds used in gasoline. Bromine compounds are also widely used in pesticides and for treating plastic material and textiles to make them fireproof.

**CADMIUM**

Cadmium is a **heavy metal** found naturally in soils and rocks. It is soft and has a silvery colour. It is mined and used in some industries to make things such as batteries, some **pesticides**, and some types of paint.

**CANADIAN ARCTIC CONTAMINANTS ASSESSMENT REPORT II**  
This report, also referred to as CACAR II, is a comprehensive assessment of contaminants in the Arctic. CACAR II contains detailed results of all the research that was conducted over the past five years under the second phase of the **Northern Contaminants Program**.

**CANCER**

Cancer is a disease that results in uncontrolled, abnormal growth of the body's cells resulting in tumors (large masses of cells).

**CHLORDANE**

Chlordane is a colourless, odourless **POP** used as an **insecticide**. It can affect the nervous system of humans and wildlife. Chronic exposure to humans can cause liver damage and possibly cancer. It is currently restricted in use for such things as termite control and non-food plants.

**CHLORINE**

Chlorine is a naturally occurring, poisonous greenish-yellow gaseous non-metallic element used for purifying water, bleaching and in the manufacturing of many organic chemicals. It occurs naturally only as a salt, as in sea water.

**CONGENER**

The individually distinct chemicals that belong to a family of chemicals with similar basic structure, such as **PCBs** and **Dioxins**, are known as congeners. PCBs are a mixture of different **PCB congeners**.



## CONTAMINANTS

A contaminant is a substance that is found in a place where it should not be. This does not necessarily mean that it is harmful, but depending on what it is and the amount that is present, it may be. The types of contaminants that are found in the Canadian north include:

- **Persistent Organic Pollutants (POPs)**, a group of mostly human-made chemicals which includes the substance called **organochlorines (OCs)** and can stay in the environment for many years without changing. They can be transported long distances in the atmosphere.
- **Heavy metals** such as mercury, cadmium, and lead; and
- **Radionuclides** such as cesium, strontium, and polonium

## COPPER

Copper is a reddish metal found naturally in some soils and rocks. It is a very good conductor of heat and electricity, and is often used to make electrical wires.

## DDE

DDE is a **POP** found in the environment as a result of the breakdown of **DDT**, an **insecticide**.

## DDT

DDT is a **POP** developed in the 1940s to kill lice and to kill biting insects that carry diseases such as malaria, yellow fever, and typhus. DDT was heavily used to kill insects feeding on crops in the 1950s and 1960s in the Great Lakes region until it was found to be harmful to other forms of life. DDT is banned in Canada.

## DIOXINS/FURANS

Dioxins and furans are highly toxic chemical substances. Dioxins and furans are known to cause serious health problems, including **cancer**, in laboratory animals. The biggest source of dioxins and furans in Canada is the large-scale burning of municipal waste.

## DISEASE RESISTANCE

Disease resistance refers to the ability of animals and plants to withstand the attack from a disease.

## ECOSYSTEM

An ecosystem is a system that is formed by the interactions of organisms with their non-living environment. The organisms and the environment work together as a unit, called an ecological unit.

## ENDOCRINE-DISRUPTING EFFECTS

The endocrine system primarily controls metabolic activities through hormones. Endocrine glands secrete hormones into the blood, which carries these chemical messages to the target cells. Endocrine disrupting chemicals interfere with this process by mimicking hormones and/or blocking the target sites.

## ENDOSULFAN

Endosulfan is a POP generally used as an insecticide in the control of crop insects and mites.

## ENZYME

A biological compound that helps the body to process chemicals. Some enzymes are responsible for digesting protein in food. Other enzymes found in the liver are responsible for getting rid of contaminants.

**FALLOUT**

Fallout describes how particles that are held in the air descend to the ground and accumulate on surfaces. Fallout is generally associated with particles that have been sent into the atmosphere following a nuclear explosion or a volcanic eruption and slowly descend, falling onto ground or water surfaces.

**FOOD CHAIN**

Plants and animals can be linked together in feeding relationships called food chains. At the bottom of food chains are green plants that convert sunlight into food energy for the rest of the chain. Animals that eat the plants are then eaten by another animal, and so on up the chain. The number of animals involved can vary. For example, in the North, the lichen—> caribou—> human food chain has fewer feeding links, and is much shorter than the algae (a small plant that lives in water but needs sunlight)—> fish—> seal—> polar bear—> human food chain. In nature, food chains overlap to form **food webs**.

**Food Chain Length Comparison (Marine vs Land Animals)****FOOD CONSUMPTION ADVISORIES**

Food consumption advisories are sometimes issued by the Territorial health departments in consultation with Health Canada when they determine that the level of **contaminants** in a traditional/country food may risk the health of those who eat this food. Such an advisory may recommend, for example, that people should only eat a certain number of livers from a particular fish species in a year.

**FOOD WEB**

A food web is the interaction of **food chains**. Food chains, which involve a direction from lower to higher ordered organisms, interact with one another in nature and form webs. These webs are more complex than chains as different organisms cross over into other chains and complicate the flow of energy from one species to another. (See food chain).

**HEAVY METALS**

Heavy metals are naturally-occurring metals found in rocks and soils. They are also released to the environment by human activities. They generally do not decay into other elements and, therefore, persist in the environment. Examples of heavy metals are mercury and cadmium.

**HEXACHLOROCYCLOHEXANE (HCH)**

Hexachlorocyclohexane (HCH) is a **POP** used to kill insects, an **insecticide**. It does not break down easily in the environment, and can be transported great distances in the atmosphere.

**IMMUNE SYSTEM**

The immune system is made up of cells and tissues responsible for recognizing and attacking foreign microbes and substances in the body.

**IMMUNOTOXIC**

Something, eg. bacteria or chemical, that causes damage to the immune system is immunotoxic.

**INORGANIC**

Inorganic material is inanimate (e.g. non-living) in nature and makes up the **abiotic** environment.

**ISOTOPE**

Isotopes are species of atoms of the same element with nearly identical chemical behaviour but with different mass and physical properties. For example, different isotopes of carbon and nitrogen can be found in nature.

**ISOMER**

Isomers are different forms of the same chemical compound, being made up of the same number and composition of atoms, but in different arrangements. Each isomer can have slightly different properties.

**LEAD**

Lead is a soft, blue-grey, easily-worked heavy metal that is naturally present in rocks and soils. It is used to make some kinds of glass, shot for shotguns, and combined with other metals for use in a variety of metallic items. Lead may be released to the environment by human activities, including the use of leaded-gasoline (in North America, lead was added to gasoline until the 1980s). Lead can be **toxic** to living things. In animals and people, lead accumulates in the brain and bones.

**LIPOPHILIC**

Attracted to fatty tissues.

**LONG-RANGE TRANSPORT**

Long-range transport refers to the movement of **contaminants** through the atmosphere or the ocean from distant sources. Many contaminants that are detected in the Arctic have been used in places rather far away but travel through the air and ocean currents eventually reaching the Arctic where they are deposited.

**MERCURY**

Mercury is a **heavy metal** that is naturally found in rocks and soil in combination with other chemicals.

**Hg**

It is the only metal that is liquid at room temperature. It is silvery in colour and flows easily so it is sometimes used in thermometers. There are many human-made sources of mercury that are released to the atmosphere. Also, mercury may be released when soils are flooded in the creation of reservoirs for making electricity (hydroelectric dams). Mercury is toxic to most living things. It accumulates in the liver, kidneys, hair, and skin of animals and people.

**METHYLMERCURY**

Mercury, like other metals, can be found in different chemical forms in the environment. Methylmercury is the mainly organic form of mercury that is the most toxic and likely to cause effects. Methylmercury can also **bioaccumulate** and **biomagnify** in food webs.

**METABOLISM**

The sum of physical and chemical processes occurring within a living cell or organism that are necessary for the maintenance of life. Under these processes, substances are broken down to provide energy for certain vital processes while other substances, necessary for life, are created.

**METABOLITE**

A substance essential to the **metabolism** of a particular organism or to a particular metabolic process.

**NEUROTOXIC**

Neurotoxic effects are caused by substances that are considered to be toxic to living organisms. These substances can cause irreversible damage to the central nervous system.

## NORTHERN CONTAMINANTS PROGRAM (NCP)

The Northern Contaminants Program (NCP) has been developed through consultation with the scientific community, Northern Aboriginal organizations, other governmental departments, and Northern communities. Its goal is to reduce and wherever possible eliminate contaminants in traditional/country food. This goal is supported by involving Northerners in the program, and by providing them with the tools and information for making their own informed decisions on food consumption.

## OOCYTES

A cell that gives rise by meiosis (cell division from a single diploid cell to four haploid cells) to an ovum (female egg cell).

## ORGANIC

Organic material is derived from living organisms and is made up of carbon-based compounds.

## ORGANOBROMINE

Organobromines are bromine-containing chemicals made by humans. Several organobromines are used as flame retardants in plastics.

## ORGANOCHLORINES (OC)

Organochlorines (OCs) are chlorine-containing chemicals made by humans. Organochlorines dissolve in fats and oils, and, therefore, are stored in the fat and blubber of animals (i.e. bioaccumulate) and are passed on through the food chain (i.e. biomagnify). Examples of OCs include: **toxaphene**, and **chlordane**. Organochlorines can be **toxic** or **poisonous** to living things.

## PBDES/BDPES

Polybrominated diphenyl ethers and brominated diphenyl ethers are a group of human-made **organobromine** chemicals that are used as flame retardants in various plastic materials, such as polystyrene. (See also **PBBs**).

## PCBs

Polychlorinated biphenyls (PCBs) are a group of human made, industrial **POP** chemicals. There are many different kinds of PCBs. Because they do not conduct electricity, PCBs were used in electrical transformers as insulators since the 1930s. PCBs do not break down easily in the environment and there is concern that they may be harmful to living things. Some kinds of PCBs are thought to cause cancer and may contribute to other subtle effects in unborn children. The use of PCBs was banned in many countries, including Canada, in the 1970s.

## PATHOLOGY

The study of the essential nature of diseases and especially of the structural and functional changes produced by them.

## PERFLUORINATED ACIDS (PFAS)

Perfluorinated acids (PFAs) have no known route of degradation or metabolism under normal environmental conditions, meaning that they are extremely persistent in the environment. Examples of PFAs are **perfluorooctane sulfonate (PFOS)** and **perfluorooctanoic acid (PFOA)**.

## PERFLUOROOCTANE SULFONATE (PFOS)

Perfluorooctane sulfonate is an example of a **perfluorinated acid (PFA)** that has recently been identified in liver and blood of polar bears and seals in the Arctic, including some samples from Nunavut. There is a lot of concern about the presence of this chemical in the environment as **PFAs** are highly **persistent** and seem not to degrade. It can cause cancer, lead to enlarged livers as well as affect the fertility of wildlife.

**PERFLUOROOCTANOIC ACID (PFOA)**

Perfluorooctanoic acid (PFOA), similar to (PFOS), is a **perfluorinated acid (PFAs)** that has recently been identified in liver and blood of polar bears and seals in the Arctic, including some samples from Nunavut. There is a lot of concern about the presence of this chemical in the environment as **PFAs** are highly **persistent** and not known to degrade. It can cause cancer, lead to enlarged livers as well as affect the fertility of wildlife.

**PERSISTENT**

Persistent, when referring to chemicals, is the resistance of a chemical to break down. A persistent chemical, once introduced, stays in the environment for an indefinite length of time.

**PERSISTENT ORGANIC POLLUTANTS (POPs)**

Persistent organic pollutants (POPs) are a group of mostly human-made chemicals used as pesticides and as industrial chemicals and which includes the substances called **organochlorines (OCs)**. POPs can be transported long distances in the atmosphere and can stay in the environment for many years without changing.

**PESTICIDES**

Pesticides are poisons used to kill pests (plants or animals that are a nuisance or harmful). There are two main types: insecticides used to kill insects, and herbicides used to kill weeds, mold, and fungus. **Chlordane**, **toxaphene**, **HCH**, and **DDT** are examples of pesticides.

**POLYBROMINATED BIPHENYLS (PBBS)**

Polybrominated biphenyls are a group of human-made **organobromine** chemicals that are used as flame retardants in various plastic materials, such as polystyrene. (See also **BDPEs**)

**POLYCHLORINATED N-ALKANES (PCAs)**

Polychlorinated n-alkanes are a group of toxic chemicals belonging to the polychlorinated aromatic compounds (**PCAs**). Their most common applications include use as high temperature lubricants in metal-working machinery.

**POLYCHLORINATED NAPHTHALENES (PCNs)**

These chemicals are a group of 75 compounds which have been used as lubricants, fungicides, insecticides, and as insulators which pre-date **PCBs**. They are similar in structure to **PCBs**, and are toxic.

**QUALITY ASSURANCE/QUALITY CONTROL**

Because research is conducted by many different people in many regions across the country, it is often difficult to ensure that the same standards in producing data are in use. Quality assurance/quality control is a system of procedures and corrective actions that attempt to ensure that the different research studies, environmental monitoring and sampling, and other technical and laboratory activities are comparable with another and the data reported are of the highest quality possible.

QA/  
QC

**RADIONUCLIDES**

Radionuclides are atoms that emit radiation and, like **heavy metals**, are naturally present in rocks and soils. They may also be human-made. Certain kinds of radionuclides have been released to the environment through atmospheric testing of nuclear weapons, nuclear waste dumping and uranium mining. Radionuclides tend to accumulate in the bones and muscles of animals and people. Natural radionuclides in the Canadian North include polonium and lead.



**RISK ASSESSMENT**

The qualitative and quantitative study of the risk posed to human health and the environment by the presence and/or use of specific pollutants.

**SELENIUM**

Selenium is a nonmetallic element that resembles sulfur. It can be naturally found in rock and soils from some areas and it has been suggested that at the right concentration, it can counteract the effects of mercury, but this is unproven as of yet.

**SERUM**

The fluid part of blood is called plasma. Serum is this fluid minus the fibrogen (blood clotting property).

**STRONTIUM**

A naturally occurring radioactive element which is used to date rock and sediments.

**TEMPORAL TRENDS**

Changes over time.

**TOXAPHENE**

Toxaphene is a POP chemical that was used as a pesticide from the 1950s to 1970s. It is very poisonous to living things, especially fish. Toxaphene has never been licensed for use in Canada, and it was banned in the United States in 1982.

**TOXIC (TOXICITY)**

Toxic (toxicity) refers to the capability of a substance to cause harm or be poisonous to humans, animals, or other living things. In common usage, the term toxic substances refers to chemical substances that are capable of causing harm at very low levels of exposure.

**TOXICOLOGY**

Toxicology refers to the scientific study of the effects, chemistry, and treatment of poisonous (toxic) substances.

**TROPHIC LEVELS**

Levels in a food web characterized by organisms which are the same number of steps removed from the primary producers of **ecosystems** (e.g., generally aquatic and terrestrial green plants comprise the first trophic level, and plant-eating organisms comprise the second.)

**VAPOUR**

A substance in the gaseous state, as distinguished from a liquid or solid state.

**ZINC**

Zinc is a brittle metal at ordinary temperatures, and is not found abundantly in nature. It is used in the preparation of certain metal alloys, like bronze and brass. An excess of zinc can be toxic.

**ZOOPLANKTON**

The passively floating or weakly swimming microscopic animal life in a body of water.

## Affiliations and Project Leaders

The following list can be used to search for a project by affiliation or project leader.

### **Centre for Indigenous Peoples' Nutrition and Environment (CINE) and McGill University**

Kuhnlein, Harriet: pages: 55, 127

### **Centre Hospitalier Universitaire de Québec (CHUQ)**

Ayotte, Pierre: pages: 97, 125

Dewailly, Eric: pages: 89, 99

Furgal, Chris: pages: 57, 95, 107, 109

Muckle, Gina: pages: 91, 93

Pereg, Daria: page: 101

### **DMER (D. Mackay Environmental Research) Ltd.**

Mackay, Don: page: 139

### **Dene Nation:**

Paci, Chris: pages: 33, 35, 49

### **Department of Fisheries and Oceans (DFO)**

Stern, Gary: pages: 13, 39, 41, 63

Macdonald, Robie: page: 47

Tomy, Gregg: pages: 81, 83

### **Indian and Northern Affairs Canada (INAC)**

Mills, Carole: pages: 33, 35, 37

Roach, Pat: pages: 5, 7, 9, 11, 13, 15, 17

Stephens, Glen: pages: 59, 61

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### **Dogrib Treaty 11 Council**

Blondin, Ted: page: 27

### **Environment Canada (EC)**

Blanchard, Pierrette: page: 73

Braune, Birgit: pages: 69, 71

Cheam, Ven: page: 67

Evans, Marlene: pages: 43, 45

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### **Government of the Northwest Territories (GNWT)**

**Department of Resources, Wildlife and Economic**

**Development**

Case, Ray: page: 49

**Gwich'in Tribal Council**

Carmichael, Fred: page: 31

**Inuit Circumpolar Conference (ICC)**

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**Inuit Tapiriit Kanatami (ITK)**

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**Inuvialuit Regional Corporation (IRC)**

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**Labrador Inuit Association (LIA)**

Denniston, Mary: page: 105

**Nunavik Health and Nutrition Committee (NHNC)**

Grey, Minnie: pages: 103, 109

**Sahtu Dene Council**

Hutchinson, Larry: page: 25

**Selkirk First Nation**

Trudeau, Don: page: 19



## Key Subject Areas and Contaminants

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**CADMIUM**

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**CHLORDANE**

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**DDT/DDE**

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**HCH**

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**TRADITIONAL KNOWLEDGE**

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## For More Information

If you wish to obtain more information on any of the projects within this booklet or have any questions regarding contaminants in general, please feel free to contact any of the persons listed below, they will be glad to assist you.

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## Acknowledgements

We would like to thank all project team members for the time they took to provide project summaries. Thanks also to Russel Shearer, Sarah Kalhok and Jennifer Balzana, who took the time to review, edit and supply comments and recommendations on the 2002-2003 edition of the Northern Contaminants Program Summary Booklet.

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French and Inuktitut versions available.







